

Corporate Environmental Remediation



Sunoco, Inc.
10 Industrial Highway MS4
Lester, PA 19029

January 23, 2013

Mr. Steve O'Neil
Chief, Operations Section
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, PA 19401

Re: Philadelphia Refinery Remediation Program
Remediation Status Report, Fourth Quarter 2012

Dear Mr. O'Neil:

Enclosed for your review is a quarterly summary report for Operation & Maintenance (O&M) work completed at the Philadelphia Refinery between October 1 and December 31, 2012. Detailed information regarding O&M activity is included in the attached tables and figures for the Philadelphia Refinery as prepared by Stantec Consulting Services Inc. (Stantec). This letter summarizes the information detailed in the tables plus additional activities under the Consent Order & Agreement (CO&A) such as investigations of the various Areas of Interest (AOIs).

Pursuant to the 2003 CO&A between Sunoco and the PADEP, Sunoco has completed site characterization activities for all 11 AOIs. This facility has since been entered into the Pennsylvania One Cleanup Program. On November 30, 2011, Sunoco submitted a "Work Plan for Site Wide Approach under the One Cleanup Program" (Site Wide Approach) to PADEP and USEPA. The Site Wide Approach expands the technical approach outlined in the CO&A and provides a schedule for future Act 2 submissions with respect to the Philadelphia Refinery remediation program. Site Characterization Reports submitted to the agencies will be repackaged into Site Characterization/Remedial Investigation Reports (SCR/RIR). Status and anticipated dates of submittals will be updated in the quarterly Remediation Status Reports.

As the Department is aware, on September 8, 2012, Sunoco conveyed the refinery to Philadelphia Energy Solutions Refining & Marketing (R&M) LLC (PES). As part of that transaction, Sunoco retained responsibility for remediation activities for environmental conditions existing at the time of the transfer. Accordingly, Sunoco will continue to submit the required documentation and implement the required remedial obligations.

AOI 1 – Belmont Terminal / No. 1 Tank Farm / No. 2 Tank Farm

Consent Order / Characterization Status

Sunoco submitted to PADEP and USEPA a Site Characterization Report for AOI 1 dated June 30, 2005. Based on comments received by PADEP with regard to the AOI 1 Site Characterization Report, Sunoco prepared and submitted to PADEP a revised Site Characterization Report for AOI 1 dated July 17, 2006. The recommendations in the AOI 1 report were to supplement the existing remediation system along the

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northwestern portion of the Belmont Terminal and southeastern portion of the #1 Tank Farm. Sunoco has implemented these actions as detailed in previous quarterly reports. In addition, Sunoco provided PADEP a Remedial Action Plan (RAP) for AOI 1 in January 2008. As a result of the 26th Street North remediation system study and the S-50 Area investigation, an addendum to the RAP was considered necessary. In December 2008, a RAP addendum for AOI 1 was submitted to address the 26th Street North recovery system data analysis and the S-50 Area (26th Street South) investigation and subsequent remedial actions. In accordance with the Site Wide Approach, a repackaged Site Characterization Report/ Remedial Investigation Report (SCR/RIR) is currently being prepared for AOI 1. It is anticipated that the repackaged SCR/RIR will be submitted to the agencies in June 2014 with the subsequent submittal of the Cleanup Plan in June 2015.

Belmont Terminal – Operation During the Quarter

The Loading Rack system has active water pumps in RW-22 through RW-24. The Loading Rack System was operational throughout the quarter with the exception of routine/minor maintenance. Product pumps in RW-22, RW-23, and RW-24 were turned off but are checked weekly and manually operated as recoverable product thicknesses accumulate in each well.

The Frontage Road system was restarted on July 10, 2012. On August 30, the Frontage Road System was turned off and will remain offline unless there are significant increases in LNAPL in the recovery wells. The wells were gauged weekly and no product was detected during the reporting period.

A total of 969,183 gallons of groundwater was recovered by the Belmont Terminal recovery systems. No LNAPL was recovered. System recovery totals for the quarter can be found in Attachment 1.

Belmont Terminal – System Performance

The Frontage Road system, when active, discharges directly into a benzene NESHPA controlled sewer routed to the Point Breeze Area Wastewater Treatment Plant rather than discharging to the City of Philadelphia sewer system. Recovered groundwater from the Loading Rack system is discharged to the same refinery sewer and recovered LNAPL is discharged to an onsite 5,000-gallon recovery tank, the contents of which are recycled by the refinery on an as needed basis.

Shunk Street Sewer Ventilation System and Biofilter – Operation During the Quarter

The biofilter was operational for the reporting period. System data for the quarter can be found in Attachment 1.

26th Street Sewer Area – Operation During the Quarter

Due to high iron content of the total fluids recovered, the pumps routinely become fouled. During weekly visits, pumps are pulled, cleaned, and redeployed as needed. Similarly, the system flow meter also fouls with iron, therefore, actual gallons recovered may be greater than recorded for some weekly visits. The system was operational for the reporting period although the flow meter bypass was opened the second week of the period. The flow meter was found inoperable on December 6 and on December 14 at which point it was bypassed pending replacement.

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A total of 82,897 gallons of total fluids was recovered by the 26th Street recovery system. System recovery totals for the quarter can be found in Attachment 1.

26th Street Sewer Area – System Performance

26th Street North:

Sunoco has conducted a performance assessment of this system to better determine the effectiveness of remediation in this area. In general, Sunoco believes that the reporting of groundwater and LNAPL recovery provides limited indication of system performance, and should be supplemented with measurements related to maintaining groundwater level and affecting a gradient towards collection points.

It was concluded in the AOI 1 RAP Addendum that the extent of LNAPL has not changed significantly; however LNAPL thickness appears to have decreased over time, indicating stability of LNAPL along the 26th Street North Area.

26th Street South (S-50 Area):

A comprehensive groundwater investigation was conducted in the 26th Street South area. This data and proposed remedial action was included in the AOI 1 RAP Addendum. To minimize the migration of soluble phase contaminants, a biologically active aerobic barrier utilizing oxygen injection was recommended for the area. A thirty point O₂ injection system was installed to accomplish this barrier. Operational and performance data is collected in accordance with the performance monitoring plan and is included in Attachment 2.

26th Street Biofilter – Operation During the Quarter

The biofilter was operational throughout the quarter with the following exception. The system was turned off November 19 due to a steam leak and was returned to service on November 20. A smoke test was conducted on active cells 1 and 2 on October 26. The system operation is checked once per week and includes the collection of influent and effluent vapor concentrations utilizing a photoionization detector (PID). System data for the quarter can be found in Attachment 1.

AOI 2 – Point Breeze Processing Area

Consent Order / Characterization Status

The AOI 2 SCR/RIR was submitted to PADEP and USEPA on September 29, 2010. It is anticipated that a RIR addendum will be submitted to the agencies in August 2013 with a subsequent submittal of the Cleanup Plan in December 2013.

Pollock Street Sewer Area – Operation During Quarter

During October 2011, heavier than usual quantities of oil were observed within the Pollock Street sewer outfall. As a result, Sunoco completed the expansion of the existing vertical recovery well remediation system in the vicinity of the Pollock Street sewer outfall in February 2012. The system, referred to as the Pollock Street West End System, consists of a total of ten 4-inch diameter recovery wells on the east side of River Road and twenty 6-inch diameter recovery wells on the west side of River Road. Water and LNAPL are removed from select recovery wells using pneumatic submersible pumps. All liquids are processed through an oil water separator. Water is discharged to a refinery process sewer and oil is

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recovered in a series of two 550-gallon tanks and then recycled by the refinery. The system was operational throughout the quarter with the exception of minor maintenance. Totals of 2,713,884 gallons of groundwater and 4,312 gallons of LNAPL were recovered by this system in the quarter. A report describing the details of the investigation and remediation performed in response to the fugitive oil observed in the Pollock Street outfall was submitted to PADEP and USEPA on June 29, 2012.

The vertical well system now consists of RW-101, RW-102, and RW-103. These wells were operational throughout the quarter with the exception of routine maintenance. A total of 882,750 gallons of total fluids were recovered by the Pollock Street vertical well recovery system. All other vertical wells are either turned off or incorporated into the West End System. System recovery totals for the quarter can be found in Attachment 1.

Horizontal Wells HW-1, HW-2 and HW-3 were operational for the reporting period with the exception of routine maintenance. The flow rates for the horizontal well recovery system are estimated to be as follows:

- HW-1: 8 gpm
- HW-2: 3.7 gpm
- HW-3: 15.4 gpm

A total of 3,529,339 gallons of total fluids was recovered by the Pollock Street horizontal well recovery system. System recovery totals for the quarter can be found in Attachment 1.

The outfall skimmer was operational throughout this reporting period until September 24 when it was shutoff pending removal of mud and debris from the outfall. The outfall was cleaned and skimmer returned to service on October 18. The skimmer system was turned off October 26 through October 31 due to Hurricane Sandy. On December 21, the transfer pump was submerged and system components damaged due to heavy, overnight rains. The system was repaired and restarted on December 26. The Pollock Street Sewer outfall is checked three times per shift and all findings are recorded. This practice will continue and any LNAPL will be handled with spill control equipment to minimize or prevent releases to the Schuylkill River. Sunoco has continued to maintain boom and sorbent sweeps around the tide gate area. Outfall cleaning, including the changing of sorbents and removal of any fugitive LNAPL from the outfall, occurs a minimum of twice per week. The skimmer discharge was tied into the West End System treatment trailer during construction of the Pollock Street West End System.

Short Pier – Operation During the Quarter

There was no evidence of LNAPL migration to the river during the reporting period. Unless evidence of LNAPL migration to the river occurs, the system will remain offline.

AOI 3 – Impoundment Area

There are no groundwater or LNAPL recovery systems active in this area. The AOI 3 SCR/RIR was submitted to PADEP and USEPA on September 27, 2010. The SCR/RIR stated that given the limited occurrence and mobility of LNAPL observed in RW-2, the recovery system will remain offline. The disposition of remediation systems in AOI 3 will be revisited in the Cleanup Plan. It is anticipated that a RIR addendum will be submitted to the agencies in January 2014 with the subsequent submittal of the Cleanup Plan in June 2014.

AOI 4 – No. 4 Tank Farm Area

Consent Order / Characterization Status

AOI 1 and AOI 4 were identified by Sunoco as the first areas of the Refinery to be investigated in accordance with the Phase II Corrective Action Schedule included in the CCR. Following characterization of AOI 4, Sunoco recommended the installation of a hydraulic control system on the southern border of AOI 4. This system is designed and permitted for discharge by the Philadelphia Water Department (PWD). A permit to operate from Air Management Services has been received by Sunoco. The installation of this remediation system was completed in December 2012. Minor modifications to the system are being implemented to facilitate water discharge monitoring in accordance with the PWD permit. System startup is expected in February 2013. It is anticipated that the repackaged SCR/RIR will be submitted to the Agencies in June 2013 with a subsequent submittal of the Cleanup Plan in March 2014.

S-30 and S-36 LNAPL Recovery Systems – Operation During the Quarter

Due to the absence of recoverable product in the recovery wells, Sunoco recommends that S-30, S-34, S-35, and S-36 remain offline.

AOI 5 – Girard Point South Tank Field

Consent Order / Characterization Status

In accordance with the Site Wide Approach, a repackaged Site Characterization Report/Remedial Investigation Report/Cleanup Plan (SCR/RIR/Cleanup Plan) was submitted to PADEP and USEPA on December 13, 2011. Sunoco received PADEP's comment letter for AOI 5 on March 15, 2012. A RIR Addendum will be submitted to the Agencies in April 2013 with a subsequent submittal of the Cleanup Plan in June 2013.

9 Berth – Operation During the Quarter

The system remains offline due to limited presence of LNAPL.

AOI 6 – Girard Point Chemicals Processing Area

Consent Order / Characterization Status

AOI 6 was identified by Sunoco as the third area of the Refinery to be investigated in accordance with the Phase II Corrective Action Schedule included in the CCR. A Site Characterization Report for AOI 6 was submitted to PADEP and USEPA on September 29, 2006. It is anticipated that the repackaged SCR/RIR will be submitted to the agencies in April 2013 with a subsequent submittal of the Cleanup Plan in September 2013.

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27 Pump House – Operation During the Quarter

The system was turned off September 20, 2010 due to absence of recoverable product. Recovery wells B-124, B-137, B-139, B-142, and B-143 contain absorbent socks. Absorbent socks were placed in B-132 and B-147 on October 10. During the reporting period, wells were routinely gauged and the socks were replaced when necessary. LNAPL recovery volumes are recorded using a graduated beaker and recovered product is transferred to the system holding tank. Passive remediation will continue until no measurable product is observed or until recoverable thicknesses of LNAPL return to the recovery wells.

Approximately 13.5 gallons of LNAPL were recovered using the above referenced methods. Recovery totals for the quarter can be found in Attachment 1.

AOI 7 – Girard Point Fuels Processing Area

Consent Order / Characterization Status

In accordance with the Site Wide Approach, a repackaged AOI 7 SCR/RIR was submitted to PADEP and USEPA on February 29, 2012. A RIR Addendum will be submitted to the Agencies in February 2013 with a subsequent submittal of the Cleanup Plan in December 2013.

No. 3 Separator / Bulkhead Area

On July 12, 2011, Sunoco reported a hydrocarbon sheen on the Schuylkill River to the National Response Center. The sheen was directly adjacent to the Girard Point No. 3 Separator. In response to the sheen on the river, Sunoco has investigated the source of hydrocarbons to the river through the installation of monitoring wells and exploratory excavation around a process sewer junction box associated with the 137 Crude Unit and the No. 3 Separator. The monitoring wells demonstrated measurable oil on the water table and the exploratory excavation revealed integrity issues with the junction box. The junction box and associated bulkhead penetration were sealed with concrete.

Construction of a ten recovery well hydraulic control system was completed on August 23, 2012. LNAPL and water are extracted using pneumatic submersible pumps and total fluids pass through an oil water separator. Water is discharged to an onsite process sewer and LNAPL is recovered in a tank and recycled by the refinery.

The system was operational throughout the quarter with the exception of minor maintenance issues. Totals of 1,336,000 gallons of groundwater and 7,764 gallons of LNAPL were recovered by this system during this quarter. Groundwater and product recovery totals including system startup through the end of the reporting period can be found in Attachment 1.

AOI 8 – Point Breeze North Yard

Consent Order / Characterization Status

A repackaged Remedial Investigation Report incorporating PADEP's comments on AOI 8 was submitted to PADEP and USEPA on January 31, 2012. A Cleanup Plan incorporating the redevelopment efforts in the Philadelphia Refinery Point Breeze North Yard will be developed by December 2018.

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PGW Border Recovery System – Operation During the Quarter

The PGW Total Fluids Recovery System is offline. The system is being evaluated for potential upgrade.

Jackson Street Sewer Area – Operation During the Quarter

The Jackson Street Sewer Total Fluids Recovery System is offline. Due to limited LNAPL presence in the area, the system will remain off unless there are significant increases in LNAPL in the proximal wells. The Jackson Street combined sewer overflow outfall ("CSO") is checked once per shift by refinery personnel for a sheen or the presence of LNAPL. There has been no evidence of sheening throughout the quarter.

Jackson Street Sewer Water Curtain – Operation During the Quarter

The Jackson Street Water Curtain was operational during the quarter. Due to reliability issues, the flow meter for the water curtain was taken out of service. Water flow rate is irrelevant to system operation. System data for the quarter is included in Attachment 1.

Sunoco agreed at the July 30, 2009 meeting to sample the air in the sewer onsite and offsite following notification from PADEP of a neighborhood (28th and McKean Streets) complaint. No complaints were received during this quarter. Sunoco is recommending that operation of the water curtain be discontinued.

North Yard Bulkhead Area and No. 3 Tank Farm Separator – Operation During the Quarter

The system was taken offline. Due to limited LNAPL presence in the area, the system will remain off unless there are significant increases in LNAPL in the proximal wells.

AOI 9 – Schuylkill River Tank Farm

There are no groundwater or LNAPL recovery systems operational in the area. A Site Characterization Report was submitted to the PADEP and USEPA on October 30, 2009. It is anticipated that the repackaged SCR/RIR will be submitted to the agencies in April 2014 with a subsequent submittal of the Cleanup Plan in September 2014.

AOI 10 – West Yard

There are no groundwater or LNAPL recovery systems operational in the area. A SCR/RIR was submitted to PADEP and USEPA on June 30, 2011. Approval of the Remedial Investigation Report was received from PADEP on January 6, 2012. A Cleanup Plan incorporating the redevelopment efforts in the Philadelphia Refinery Point Breeze West Yard will be developed by December 2018.

AOI 11 – Deep Aquifer

The SCR/RIR was submitted to PADEP and USEPA on September 12, 2011. Sunoco received comments to the report by email on December 9, 2011. It is anticipated that the Final Report will be submitted to the agencies in July 2013.

Passyunk Avenue Sewer

The Passyunk Avenue Sewer CSO is checked once per shift at low tide and findings are recorded. LNAPL was not observed at the Schuylkill River outfall during the quarter.

Groundwater Monitoring

The current monitoring program consists of quarterly groundwater and LNAPL gauging of select wells, annual groundwater and LNAPL gauging of existing wells, and annual groundwater sampling of select perimeter monitoring wells. The site-wide annual well gauging event is typically conducted during the second quarter of each year with results used to identify the presence of LNAPL and determine groundwater flow patterns. During the first, third, and fourth quarters, select wells are gauged to monitor LNAPL thickness and determine hydraulic effects of targeted recovery systems. Liquid level measurements collected during the Fourth Quarter 2012 are provided in Table 1.

The purpose of the annual groundwater sampling event is to evaluate concentration trends at the perimeter of the refinery. The annual groundwater sampling program consists of sampling select wells throughout the Point Breeze and Girard Point Processing Areas and has historically been performed during the fourth quarter of each year. However, future annual perimeter groundwater sampling will be performed in the second quarter in conjunction with annual site-wide gauging. Groundwater samples will be analyzed pursuant to the Pennsylvania's Land Recycling Program for leaded and unleaded gasoline and No. 2, 4, 5, and 6 fuel oils. These parameters include benzene, toluene, ethylbenzene, xylenes (BTEX), cumene (isopropylbenzene), 1,2-dibromoethane (EDB), 1,2-dichloroethane (EDC), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, methyl tertiary butyl ether (MTBE), anthracene, benzo(a)anthracene, benzo(g,h,i)perylene, benzo(a)pyrene, benzo(b)-fluoranthene, chrysene, fluorene, naphthalene, phenanthrene, pyrene, and dissolved lead.

This year, the annual gauging and sampling schedule was altered in order to perform synoptic events with PGW and DLA for purposes of generating a larger scale groundwater elevation map tying all of the facilities together. The gauging was performed in May 2012 and the data was included in the Third Quarter 2012 Remediation Status Report. Groundwater sampling of the groundwater wells in AOI 1 was performed synoptically with PGW and DLA in July 2012. The results of the full effort will be submitted under separate cover.

Please contact me at (610) 833-3444 with any questions or comments.

Best Regards,



James Oppenheim, PE
Senior Environmental Consultant

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Enclosures (electronic):

Figure 1 – Site Location Map
Figure 2 – Remediation System Areas Site Plan
Table 1 – Fourth Quarter 2012 Gauging Event
Attachment 1 – Remediation System Recovery Total Data
Attachment 2 – 26th Street South (S-50 Area) Report

Cc:

United States Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103
Attention: Mr. Paul Gotthold (3WC22)

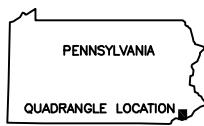
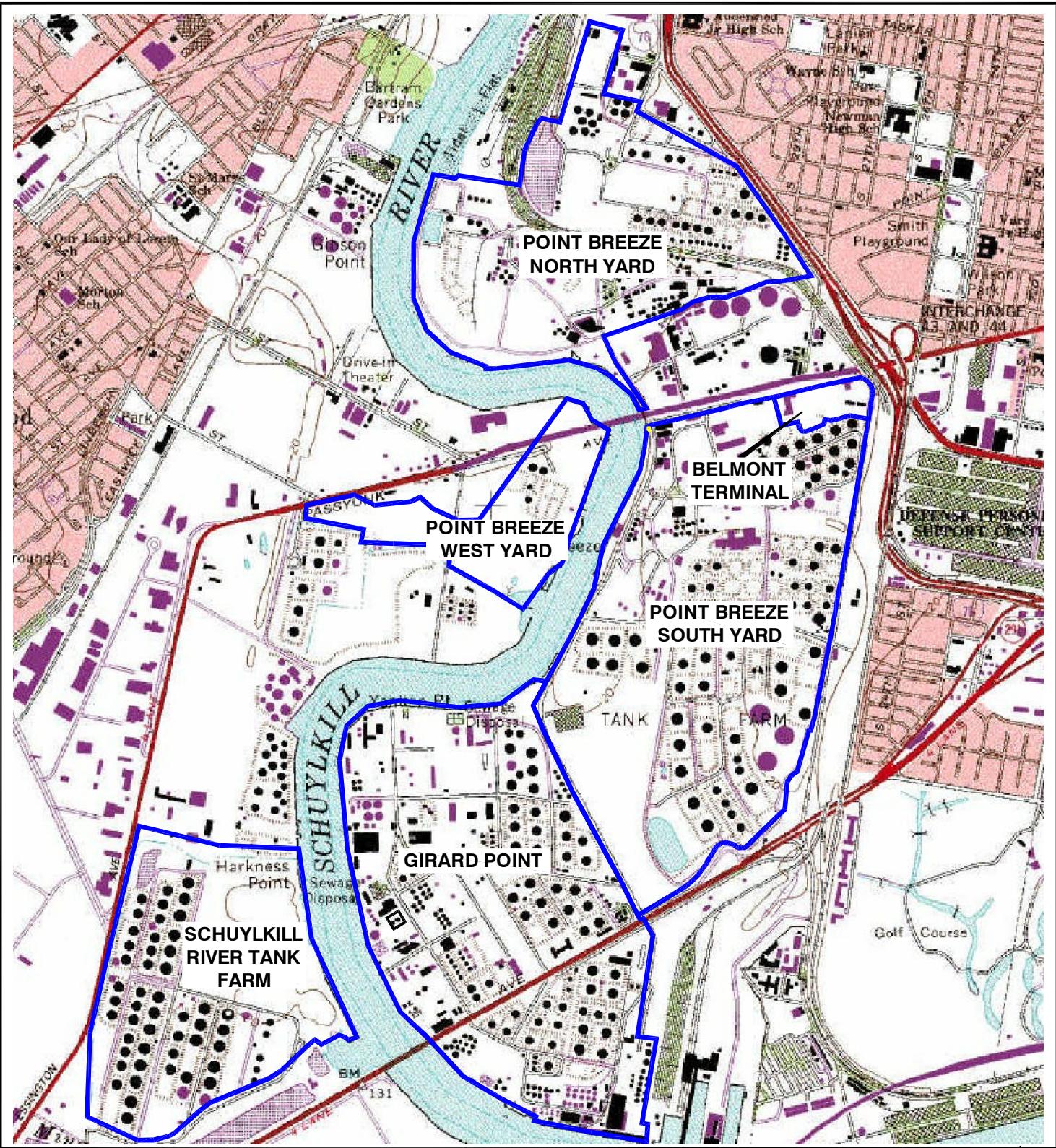
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Charles D. Barksdale, Jr. PE
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3144 Passyunk Avenue
Philadelphia, PA 19145

File: Remediation Status Report
Philadelphia Refinery, 4th Quarter 2012

FIGURES



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SCALE (MILES)

N

REFERENCE: USGS 7.5 MINUTE QUADRANGLE; PHILADELPHIA, PENNSYLVANIA-NEW JERSEY; 1995

 <p>Stanite Consulting Services Inc. 1060 ANDREW DRIVE, SUITE 140 WEST CHESTER, PENNSYLVANIA 19380 Tel. 610.840.2500 Fax. 610.840.2501 www.stanitec.com</p>	FOR:	SITE LOCATION MAP PHILADELPHIA REFINERY REMEDIATION PROGRAM		FIGURE:
	SUNOCO, INC. (R&M) PHILADELPHIA REFINERY PHILADELPHIA, PENNSYLVANIA	JOB NUMBER: DRAWN BY: CHECKED BY: APPROVED BY: DATE:	1	1/23/2013
	JOB NUMBER: DRAWN BY: CHECKED BY: APPROVED BY: DATE:	TFB JLM JLM	JLM	1/23/2013



SOURCE: AOI BASEMAP PROVIDED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES

- Shallow / Intermediate / Deep Monitoring Well
- Shallow / Intermediate Monitoring Well
- Pollock Street Sewer
- Pollock Street Horizontal Well
- Remediation System Lines (White)
- Remediation System Areas (White)

- Shallow / Intermediate O₂ Monitoring Well
- Deep Monitoring Well
- Intermediate Monitoring Well
- Shallow Monitoring Well
- Other Monitoring Well
- Former Remediation System Areas

- ⊕ Piezometer
- Deep Recovery Well
- Intermediate Recovery Well
- Shallow Recovery Well
- Other Recovery Well
- SRFT = SCHUYLKILL RIVER TANK FARM

- Shallow/Intermediate Recovery Well
- OR ■ Damaged Well
- ▲ Staff Gauge
- Areas of Interest

FIGURE 2
REMEDIATION SYSTEM AREAS SITE PLAN

TABLE

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 1	MW-26	10/18/2012	22.57	24.26	1.69	No	Static	
AOI 1	MW-27	10/18/2012	24.73	25.55	0.82	No	Static	
AOI 1	MW-28	10/18/2012	---	25.10	0	No	Static	
AOI 1	MW-29	10/18/2012	24.95	25.91	0.96	No	Static	
AOI 1	MW-30	10/18/2012	---	27.83	0	No	Static	
AOI 1	MW-31	10/18/2012	---	25.89	0	No	Static	
AOI 1	MW-32	10/18/2012	---	25.34	0	No	Static	
AOI 1	MW-33	10/18/2012	---	26.67	0	No	Static	
AOI 1	MW-34	10/15/2012	---	26.75	0	No	Static	
AOI 1	MW-35	10/18/2012	---	27.30	0	No	Static	
AOI 1	MW-36	10/18/2012	---	28.45	0	No	Static	
AOI 1	MW-37	10/18/2012	---	27.54	0	No	Static	
AOI 1	MW-38	10/18/2012	---	23.64	0	No	Static	
AOI 1	MW-39	10/18/2012	---	23.55	0	No	Static	
AOI 1	MW-40	10/18/2012	23.83	24.25	0.42	No	Static	
AOI 1	MW-41	10/18/2012	23.40	23.40	<0.01	No	Static	
AOI 1	MW-43	10/15/2012	---	26.75	0	No	Static	
AOI 1	MW-44	10/18/2012	25.99	26.04	0.05	No	Static	
AOI 1	OW-2	10/18/2012	---	27.52	0	No	Static	
AOI 1	OW-12	10/18/2012	---	26.10	0	No	Static	
AOI 1	OW-13	10/18/2012	---	28.08	0	No	Static	
AOI 1	OW-14	10/18/2012	---	28.11	0	No	Static	
AOI 1	OW-16	10/18/2012	---	27.35	0	No	Static	
AOI 1	OW-17	10/18/2012	---	26.45	0	No	Static	
AOI 1	OW-18	10/18/2012	---	27.54	0	No	Static	
AOI 1	OW-19	10/18/2012	26.70	26.71	0.01	No	Static	
AOI 1	OW-20	10/18/2012	---	27.80	0	No	Static	
AOI 1	PZ-400	10/18/2012	---	24.16	0	No	Static	
AOI 1	PZ-401	10/16/2012	20.55	20.57	0.02	No	Static	
AOI 1	PZ-402	10/16/2012	19.83	19.90	0.07	No	Static	
AOI 1	PZ-403	10/16/2012	---	24.85	Yes	No	Static	too viscous to accurately measure LNAPL thickness
AOI 1	PZ-404	10/16/2012	26.67	26.81	0.14	No	Static	
AOI 1	RW-1	10/18/2012	NA	NA	NA	Yes	Static	not accessible; vehicle parked on top of vault
AOI 1	RW-4	10/18/2012	26.22	27.28	1.06	Yes	Static	
AOI 1	RW-6	10/18/2012	---	26.97	0	Yes	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 1	RW-7	10/18/2012	---	24.25	0	Yes	Static	
AOI 1	RW-15	10/18/2012	---	27.18	0	Yes	Static	
AOI 1	RW-21	10/18/2012	24.81	24.81	<0.01	Yes	Static	
AOI 1	RW-22	10/18/2012	23.02	23.40	0.38	Yes	Pumping	
AOI 1	RW-23	10/18/2012	23.10	25.50	2.40	Yes	Pumping	pump not operating at 100%
AOI 1	RW-24	10/18/2012	23.71	24.33	0.62	Yes	Pumping	
AOI 1	RW-25	10/18/2012	26.01	27.11	1.10	Yes	Static	
AOI 1	RW-26	10/18/2012	---	25.95	0	Yes	Static	
AOI 1	RW-27	10/18/2012	---	26.46	0	Yes	Static	
AOI 1	RW-28	10/18/2012	---	25.97	0	Yes	Static	
AOI 1	RW-29	10/18/2012	---	26.18	0	Yes	Static	
AOI 1	RW-30	10/18/2012	---	26.07	0	Yes	Static	
AOI 1	RW-31	10/18/2012	---	26.60	0	Yes	Static	
AOI 1	RW-32	10/18/2012	---	26.11	0	Yes	Static	
AOI 1	RW-110	10/16/2012	---	17.19	0	Yes	Static	formerly S-160
AOI 1	RW-111	10/16/2012	---	17.28	0	Yes	Static	formerly S-172
AOI 1	RW-112	10/16/2012	---	17.24	0	Yes	Static	formerly S-173
AOI 1	RW-400	10/18/2012	---	24.50	0	Yes	Pumping	
AOI 1	RW-401	10/16/2012	21.41	21.88	0.47	Yes	Static	formerly S-94
AOI 1	RW-402	10/16/2012	---	18.68	0	Yes	Static	
AOI 1	RW-403	10/16/2012	---	21.77	0	Yes	Static	formerly S-90
AOI 1	RW-404	10/16/2012	---	22.95	0	Yes	Static	
AOI 1	RW-405	10/16/2012	---	24.86	0	Yes	Static	
AOI 1	RW-406	10/16/2012	23.70	23.96	0.26	Yes	Static	
AOI 1	S-74	10/18/2012	27.18	27.56	0.38	No	Static	
AOI 1	S-75	10/18/2012	---	27.28	0	No	Static	
AOI 1	S-76	10/18/2012	---	26.00	0	No	Static	
AOI 1	S-77	10/15/2012	12.88	13.34	0.46	No	Static	
AOI 1	S-77P	10/15/2012	---	29.19	0	No	Static	
AOI 1	S-78	10/16/2012	---	27.11	0	No	Static	
AOI 1	S-79	10/16/2012	23.51	23.95	0.44	No	Static	
AOI 1	S-79P	10/16/2012	---	26.85	0	No	Static	
AOI 1	S-80	10/15/2012	---	28.25	0	No	Static	
AOI 1	S-80D	10/15/2012	---	30.16	0	No	Static	
AOI 1	S-81	10/15/2012	---	21.64	0	No	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 1	S-82	10/16/2012	23.32	23.83	0.51	No	Static	
AOI 1	S-83	10/16/2012	20.26	20.58	0.32	No	Static	
AOI 1	S-84P	10/16/2012	---	19.93	0	No	Static	
AOI 1	S-85	10/16/2012	---	24.21	0	No	Static	
AOI 1	S-86	10/16/2012	27.03	27.03	<0.01	No	Static	
AOI 1	S-87I	10/16/2012	---	25.51	0	No	Static	
AOI 1	S-88	10/16/2012	---	25.22	0	No	Static	
AOI 1	S-88A	10/16/2012	---	26.02	0	No	Static	
AOI 1	S-89	10/16/2012	---	26.70	0	No	Static	
AOI 1	S-98	10/16/2012	---	23.37	0	No	Static	
AOI 1	S-99	10/16/2012	---	25.49	0	No	Static	
AOI 1	S-100	10/16/2012	23.55	24.30	0.75	No	Static	
AOI 1	S-101	10/16/2012	---	47.74	0	No	Static	
AOI 1	S-116	10/16/2012	---	14.93	0	No	Static	
AOI 1	S-125	10/16/2012	22.95	23.22	0.27	No	Static	
AOI 1	S-126	10/16/2012	14.96	15.03	0.07	No	Static	
AOI 1	S-179	10/16/2012	---	21.70	0	No	Static	
AOI 1	S-180	10/16/2012	---	21.32	0	Yes	Pumping	
AOI 1	S-181	10/16/2012	---	25.19	0	Yes	Pumping	
AOI 1	S-182	10/16/2012	---	25.00	0	Yes	Pumping	
AOI 1	S-183	10/15/2012	---	24.15	0	Yes	Static	
AOI 1	S-184	10/15/2012	---	25.20	0	Yes	Pumping	
AOI 1	S-185	10/15/2012	---	25.55	0	Yes	Pumping	
AOI 1	S-186	10/15/2012	---	23.27	0	Yes	Pumping	
AOI 1	S-187	10/15/2012	---	24.32	0	Yes	Pumping	
AOI 1	S-188	10/15/2012	---	24.41	0	Yes	Static	
AOI 1	S-189	10/15/2012	---	24.35	0	Yes	Pumping	
AOI 1	S-190	10/15/2012	---	25.46	0	Yes	Static	
AOI 1	S-191	10/15/2012	25.02	25.20	0.18	Yes	Static	
AOI 1	S-192	10/15/2012	---	25.67	0	Yes	Pumping	
AOI 1	S-193	10/16/2012	---	24.20	0	No	Static	
AOI 1	S-194	10/16/2012	---	26.95	0	Yes	Static	
AOI 1	S-196	10/16/2012	---	45.78	0	No	Static	
AOI 1	S-198	10/15/2012	25.20	26.73	1.53	No	Static	
AOI 1	S-199	10/15/2012	25.12	26.39	1.27	No	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 1	S-200	10/15/2012	---	25.23	0	No	Static	
AOI 1	S-201	10/15/2012	23.85	24.96	1.11	No	Static	
AOI 1	S-202	10/15/2012	---	28.84	0	No	Static	
AOI 1	S-203	10/16/2012	28.54	29.06	0.52	No	Static	
AOI 1	S-205	10/16/2012	19.37	20.98	1.61	No	Static	
AOI 1	S-206	10/15/2012	---	28.08	0	No	Static	
AOI 1	S-207	10/16/2012	---	14.96	0	No	Static	
AOI 1	S-261	10/16/2012	---	22.75	0	No	Static	
AOI 1	S-265	10/16/2012	14.55	14.63	0.08	Yes	Static	
AOI 1	S-266	10/16/2012	NA	NA	NA	Yes	Static	lost in concrete piles from 26th St construction; CSX well
AOI 1	S-267	10/16/2012	---	17.56	0	Yes	Static	
AOI 1	S-268	10/16/2012	---	27.16	0	No	Static	formerly S-264; CSX well
AOI 1	S-271	10/15/2012	---	24.53	0	No	Static	
AOI 1	S-272	10/15/2012	---	24.34	0	No	Static	
AOI 1	S-273	10/15/2012	---	23.65	0	No	Static	
AOI 1	S-274	10/15/2012	---	23.54	0	No	Static	
AOI 1	S-275	10/15/2012	---	23.04	0	No	Static	
AOI 1	S-276	10/15/2012	22.82	23.53	0.71	No	Static	
AOI 1	S-277	10/16/2012	22.90	23.30	0.40	No	Static	
AOI 1	S-330	10/18/2012	---	23.82	0	No	Static	
AOI 1	S-331	10/18/2012	---	28.07	0	No	Static	
AOI 1	S-332	10/15/2012	---	26.61	0	No	Static	
AOI 1	TW-3	10/18/2012	---	28.05	0	No	Static	
AOI 1	TW-5	10/18/2012	---	27.86	0	No	Static	
AOI 1	TW-8	10/18/2012	---	26.27	0	No	Static	
AOI 1	TW-9	10/18/2012	---	27.86	0	No	Static	
AOI 1	TW-10	10/18/2012	26.52	26.61	0.09	No	Static	
AOI 1	TW-11	10/18/2012	---	28.33	0	No	Static	
AOI 1	ARCO-1	10/16/2012	---	27.34	0	No	Static	
AOI 1	ARCO-1D	10/16/2012	---	27.35	0	No	Static	
AOI 1	ARCO-2	10/16/2012	---	26.40	0	No	Static	
AOI 1	ARCO-3	10/16/2012	---	25.07	0	No	Static	
AOI 2	RW-100	10/8/2012	21.51	21.74	0.23	Yes	Static	
AOI 2	RW-101	10/8/2012	22.88	23.27	0.39	Yes	Pumping	
AOI 2	RW-102	10/8/2012	22.42	22.42	<0.01	Yes	Pumping	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 2	RW-103	10/8/2012	21.27	21.27	<0.01	Yes	Pumping	
AOI 2	RW-104	10/8/2012	---	14.25	0	Yes	Pumping	
AOI 2	RW-105	10/8/2012	---	14.30	0	Yes	Pumping	
AOI 2	RW-106	10/8/2012	---	14.60	0	Yes	Pumping	
AOI 2	RW-107	10/8/2012	---	13.82	0	Yes	Static	
AOI 2	RW-108	10/8/2012	---	9.35	0	Yes	Static	
AOI 2	RW-109	10/8/2012	---	9.37	0	Yes	Static	
AOI 2	C-HEADER	10/8/2012	16.52	16.52	<0.01	No	Static	
AOI 2	PZ-100	10/8/2012	---	17.55	0	No	Static	
AOI 2	PZ-101	10/8/2012	---	16.17	0	No	Static	
AOI 2	RIVER #1	10/8/2012	---	9.24	0	No	Static	at 09:18
AOI 2	S-48	10/8/2012	20.18	20.33	0.15	No	Static	
AOI 2	S-53	10/8/2012	19.28	19.57	0.29	No	Static	
AOI 2	S-62	10/8/2012	---	20.71	0	No	Static	
AOI 2	S-63	10/8/2012	22.87	24.38	1.51	No	Static	
AOI 2	S-64	10/8/2012	11.69	11.98	0.29	No	Static	
AOI 2	S-65	10/8/2012	9.60	9.77	0.17	No	Static	
AOI 2	S-91	10/8/2012	20.18	20.18	<0.01	No	Static	
AOI 2	S-92	10/8/2012	13.61	13.64	0.03	No	Static	
AOI 2	S-93	10/8/2012	---	20.90	0	No	Static	
AOI 2	S-130	10/8/2012	---	19.77	0	No	Static	well was dry
AOI 2	S-131	10/8/2012	16.25	17.94	1.69	No	Static	
AOI 2	S-132	10/8/2012	---	19.44	0	No	Static	
AOI 2	S-133	10/8/2012	---	19.70	0	No	Static	
AOI 2	S-134	10/8/2012	---	20.90	0	No	Static	
AOI 2	S-135	10/8/2012	21.00	22.06	1.06	No	Static	
AOI 2	S-136	10/8/2012	---	18.89	0	No	Static	
AOI 2	S-137	10/8/2012	---	18.47	0	No	Static	
AOI 2	S-139	10/8/2012	---	20.72	0	No	Static	
AOI 2	S-140	10/8/2012	---	21.26	0	No	Static	
AOI 2	S-141	10/8/2012	21.45	22.21	0.76	No	Static	
AOI 2	S-142	10/8/2012	19.35	19.78	0.43	No	Static	
AOI 2	S-143	10/8/2012	---	21.65	0	No	Static	
AOI 2	S-156	10/8/2012	18.91	19.20	0.29	No	Static	
AOI 2	S-159	10/8/2012	17.55	17.55	<0.01	No	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 2	S-165	10/8/2012	---	17.40	0	No	Static	
AOI 2	S-166	10/8/2012	---	16.63	0	No	Static	
AOI 2	S-167	10/8/2012	NA	NA	NA	No	Static	well lost
AOI 2	S-174	10/8/2012	10.31	10.91	0.60	No	Static	
AOI 2	S-175	10/8/2012	18.52	19.29	0.77	No	Static	
AOI 2	S-177	10/8/2012	---	18.68	0	No	Static	
AOI 2	S-178	10/8/2012	18.10	18.10	<0.01	No	Static	
AOI 2	S-246	10/8/2012	---	11.03	0	No	Static	
AOI 2	S-247	10/8/2012	---	11.87	0	No	Static	
AOI 2	S-248	10/8/2012	---	10.70	0	No	Static	
AOI 2	S-249	10/8/2012	---	11.61	0	No	Static	
AOI 2	S-251	10/8/2012	---	20.77	0	No	Static	
AOI 2	S-252	10/8/2012	---	21.20	0	No	Static	
AOI 2	S-253	10/8/2012	---	20.33	0	No	Static	
AOI 2	S-254	10/8/2012	---	20.48	0	No	Static	
AOI 2	S-302	10/8/2012	22.88	23.22	0.34	No	Static	
AOI 2	S-302D	10/8/2012	---	24.06	0	No	Static	
AOI 2	S-303	10/8/2012	---	21.48	0	No	Static	
AOI 2	S-304	10/8/2012	12.85	12.86	0.01	No	Static	
AOI 2	S-305	10/8/2012	---	19.16	0	No	Static	
AOI 2	S-305D	10/8/2012	---	20.47	0	No	Static	
AOI 2	S-306	10/8/2012	---	25.70	0	No	Static	
AOI 2	S-313	10/8/2012	---	22.50	0	No	Static	top of pump
AOI 2	S-314	10/8/2012	---	20.45	0	No	Static	
AOI 2	S-315	10/8/2012	---	24.00	0	No	Static	top of pump
AOI 2	S-316	10/8/2012	---	25.80	0	No	Static	top of pump
AOI 2	S-317	10/8/2012	---	19.72	0	No	Static	
AOI 2	S-318	10/8/2012	---	23.30	0	No	Static	
AOI 2	S-333	10/8/2012	---	13.47	0	No	Static	
AOI 2	S-346	10/8/2012	---	18.75	0	No	Static	newly drilled well
AOI 2	S-347	10/8/2012	18.22	19.41	1.19	No	Static	newly drilled well
AOI 2	S-348	10/8/2012	---	14.20	0	No	Static	newly drilled well
AOI 2	S-349	10/8/2012	16.67	16.98	0.31	No	Static	newly drilled well
AOI 2	RW-113	10/8/2012	---	20.10	0	Yes	Pumping	
AOI 2	RW-114	10/8/2012	---	25.40	0	Yes	Pumping	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 2	RW-115	10/8/2012	---	22.70	0	Yes	Pumping	
AOI 2	RW-116	10/8/2012	---	24.10	0	Yes	Pumping	
AOI 2	RW-117	10/8/2012	---	21.85	0	Yes	Pumping	
AOI 2	RW-118	10/8/2012	---	22.85	0	Yes	Pumping	
AOI 2	RW-119	10/8/2012	18.10	18.71	0.61	Yes	Pumping	
AOI 2	RW-120	10/8/2012	18.10	18.69	0.59	Yes	Static	
AOI 2	RW-121	10/8/2012	---	22.20	0	Yes	Pumping	
AOI 2	RW-122	10/8/2012	20.50	20.50	<0.01	Yes	Pumping	
AOI 2	RW-123	10/8/2012	14.29	14.32	0.03	Yes	Static	
AOI 2	RW-124	10/8/2012	---	22.30	0	Yes	Static	
AOI 2	RW-125	10/8/2012	---	22.10	0	Yes	Pumping	
AOI 2	RW-126	10/8/2012	12.29	12.30	0.01	Yes	Static	
AOI 2	RW-127	10/8/2012	---	26.10	0	Yes	Pumping	
AOI 2	RW-128	10/8/2012	---	21.80	0	Yes	Pumping	
AOI 2	RW-129	10/8/2012	---	21.90	0	Yes	Pumping	
AOI 3	RW-2	10/10/2012	11.68	11.99	0.31	Yes	Static	
AOI 4	RW-700	10/10/2012	17.64	17.65	0.01	No	Static	
AOI 4	RW-701	10/10/2012	---	17.89	0	No	Static	
AOI 4	RW-702	10/10/2012	---	20.59	0	No	Static	
AOI 4	RW-703	10/10/2012	19.82	20.77	0.95	No	Static	
AOI 4	RW-704	10/10/2012	---	18.30	0	No	Static	
AOI 4	RW-705	10/10/2012	---	15.57	0	No	Static	
AOI 4	RW-706	10/10/2012	---	15.58	0	No	Static	
AOI 4	RW-707	10/10/2012	---	15.95	0	No	Static	not hooked up to the new system
AOI 4	RW-708	10/10/2012	---	15.13	0	No	Static	
AOI 4	RW-709	10/10/2012	---	14.92	0	No	Static	
AOI 4	RW-710	10/10/2012	---	15.80	0	No	Static	not hooked up to the new system
AOI 4	RW-711	10/10/2012	---	15.12	0	No	Static	
AOI 4	RW-712	10/10/2012	---	15.20	0	No	Static	
AOI 4	RW-713	10/10/2012	---	14.63	0	No	Static	
AOI 4	RW-714	10/10/2012	14.78	14.98	0.20	No	Static	
AOI 4	RW-715	10/10/2012	---	14.98	0	No	Static	
AOI 4	RW-716	10/10/2012	---	15.15	0	No	Static	
AOI 4	RW-717	10/10/2012	---	15.18	0	No	Static	
AOI 4	S-29	10/10/2012	20.96	23.80	2.84	No	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 4	S-30	10/10/2012	22.32	24.20	1.88	Yes	Static	system was taken offline
AOI 4	S-34	10/10/2012	---	20.75	0	Yes	Static	system was taken offline
AOI 4	S-35	10/10/2012	---	20.75	0	Yes	Static	system was taken offline
AOI 4	S-36	10/10/2012	---	23.88	0	Yes	Static	system was taken offline
AOI 5	RWBH-1	10/10/2012	---	2.12	0	Yes	Static	
AOI 5	RWBH-2	10/10/2012	---	2.04	0	Yes	Static	
AOI 6	B-124	10/10/2012	5.46	5.62	0.16	Yes	Static	absorbent sock in well
AOI 6	B-132	10/10/2012	4.76	4.85	0.09	No	Static	absorbent sock in well
AOI 6	B-135	10/10/2012	4.74	4.74	<0.01	No	Static	
AOI 6	B-136	10/10/2012	5.14	5.14	<0.01	No	Static	
AOI 6	B-137	10/10/2012	---	4.67	0	No	Static	absorbent sock in well
AOI 6	B-139	10/10/2012	5.83	5.88	0.05	No	Static	absorbent sock in well
AOI 6	B-142	10/10/2012	---	7.29	0	No	Static	absorbent sock in well
AOI 6	B-143	10/10/2012	6.01	6.01	<0.01	No	Static	absorbent sock in well
AOI 6	B-147	10/10/2012	6.18	6.18	<0.01	No	Static	
AOI 7	RW-801	10/9/2012	---	19.95	0	Yes	Static	
AOI 7	RW-802	10/9/2012	---	20.05	0	Yes	Static	
AOI 7	RW-803	10/9/2012	---	20.55	0	Yes	Static	
AOI 7	RW-804	10/9/2012	---	20.25	0	Yes	Static	
AOI 7	RW-805	10/9/2012	17.55	17.55	<0.01	Yes	Static	
AOI 7	RW-806	10/9/2012	---	19.65	0	Yes	Static	
AOI 7	RW-807	10/9/2012	---	18.45	0	Yes	Static	
AOI 7	RW-808	10/9/2012	18.65	18.65	<0.01	Yes	Static	
AOI 7	RW-809	10/9/2012	18.90	18.90	<0.01	Yes	Static	
AOI 7	RW-810	10/9/2012	19.40	19.40	<0.01	Yes	Static	
AOI 8	RW-200	10/12/2012	---	6.65	0	Yes	Static	
AOI 8	RW-201	10/12/2012	23.76	24.02	0.26	Yes	Static	
AOI 8	RW-202	10/12/2012	---	21.37	0	Yes	Static	
AOI 8	RW-203	10/12/2012	23.42	23.56	0.14	Yes	Static	
AOI 8	RW-204	10/12/2012	20.08	21.66	1.58	Yes	Static	
AOI 8	RW-205	10/12/2012	19.90	22.51	2.61	Yes	Static	
AOI 8	RW-206	10/12/2012	22.05	23.30	1.25	Yes	Static	
AOI 8	RW-300	10/12/2012	15.03	15.29	0.26	Yes	Static	
AOI 8	RW-301	10/12/2012	---	12.42	0	Yes	Static	
AOI 8	RW-302	10/12/2012	---	13.77	0	Yes	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
Fourth Quarter 2012 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping	Comments
AOI 8	RW-303	10/12/2012	---	14.53	0	Yes	Static	
AOI 8	RW-304	10/12/2012	---	15.35	0	Yes	Static	
AOI 8	RW-305	10/12/2012	---	15.26	0	Yes	Static	
AOI 8	RW-306	10/12/2012	13.35	13.42	0.07	Yes	Static	
AOI 8	RW-307	10/12/2012	---	14.74	0	Yes	Static	
AOI 8	RW-308	10/12/2012	---	16.90	0	Yes	Static	
AOI 8	RW-309	10/12/2012	---	15.89	0	Yes	Static	
AOI 8	RW-500	10/12/2012	---	2.64	0	Yes	Static	
AOI 8	RW-501	10/12/2012	---	6.28	0	Yes	Static	
AOI 8	RW-502	10/12/2012	8.85	9.15	0.30	Yes	Static	

Notes:

All measurements are in feet.

Groundwater monitoring was performed under pumping conditions except where indicated in the comments column.

LNAPL = light non-aqueous phase liquid

--- = LNAPL not present

NM = field reading not measured

NA = Not Accessible, Not Applicable, or Not Available

DRY = well was dry at time of gauging

ATTACHMENT 1

Remediation System Recovery Data

Sunoco, Inc. Philadelphia Refinery Remediation Program
Groundwater and LNAPL Recovery Systems Operational Data
AOI 1: Belmont Terminal

Fourth Quarter 2012

Date	Ground Water Recovery			LNAPL Recovery	
	Total Recovery (gallons)	Recovery For Period (gallons)	Average Flow Rate (gpm)	Period Total (gallons)	Cumulative (gallons)
5-Oct-12	77,935,418	60,392	8.39	0.0	246,375
12-Oct-12	78,060,848	125,429	12.44	0.0	246,375
19-Oct-12	78,128,667	67,819	6.73	0.0	246,375
26-Oct-12	78,184,225	55,558	5.51	0.0	246,375
2-Nov-12	78,277,234	93,010	9.23	0.0	246,375
9-Nov-12	78,370,244	93,010	9.23	0.0	246,375
16-Nov-12	78,410,870	40,626	4.03	0.0	246,375
23-Nov-12	78,506,882	96,012	9.53	0.0	246,375
30-Nov-12	78,613,092	106,210	10.54	0.0	246,375
7-Dec-12	78,686,727	73,635	7.31	0.0	246,375
14-Dec-12	78,745,898	59,171	5.87	0.0	246,375
21-Dec-12	78,745,898	0	0.00	0.0	246,375
31-Dec-12	78,844,210	98,312	6.83	0.0	246,375

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallons per minute

The Belmont Terminal System consists of the Loading Rack System (RW-21, RW-22, RW-23, RW-24, and RW-25) and the Frontage Road System (RW-15 and RW-26 through RW-32). The Belmont System has 2 totalizers: one for the Loading Rack and one for Frontage Road.

On August 30, the Frontage Road System was turned off and will remain offline unless there are significant increases in LNAPL in the recovery wells. The wells were routinely gauged and no product was detected during the reporting period.

The Loading Rack System has product pumps in RW-22, RW-23, and RW-24 which are checked weekly and manually operated as recoverable product thicknesses accumulate in each well. Water pumps were active in RW-22 through RW-24 with the following exceptions. RW-23 was operating at 50% capacity on October 23 and pump repairs were made on November 13. Starting November 20, only RW-23 was operating while the system was being adjusted to optimize product recovery. On December 13, RW-22 and RW-24 were turned on so that the water pump in RW-23 which was tripping the breaker could be replaced. On December 20, the flow meter was dead and RW-23 was fixed after which RW-22 and RW-23 were turned off again.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: Shunk Street Sewer Ventilation System and Biofilter Operational Data
Organic Vapor Concentrations

Fourth Quarter 2012

Date	Flow Rate (CFM)	Sewer Air PID (ppm)	Total Flow PID (ppm)	Treatment Cell Effluent PID (ppm)			Treatment Cell Media Temperature (°F)		
				Cell #1	Cell #2	Cell #3	Cell #1	Cell #2	Cell #3
2-Oct-12	4950	0	0	0	0	0	76	76	76
12-Oct-12	4950	1.1	1.1	0	0	0	76	76	76
18-Oct-12	4950	0.8	0.8	0	0	0	79	79	79
23-Oct-12	4950	1.1	1.1	0	0	0	72	72	72
30-Oct-12	4950	NA	NA	NA	NA	NA	NA	NA	NA
9-Nov-12	4950	1.3	1.3	0	0	0	70	70	70
13-Nov-12	4950	0.6	0.6	0	0	0	66	66	66
20-Nov-12	4950	0.8	0.8	0	0	0	68	68	68
29-Nov-12	4950	1.1	1.1	0	0	0	65	65	65
6-Dec-12	4950	0.6	0.6	0	0	0	66	66	66
13-Dec-12	4950	0	0	0	0	0	66	66	66
20-Dec-12	4950	0.8	0.8	0	0	0	65	65	65
28-Dec-12	4950	1.3	1.3	0	0	0	62	62	62

NOTES:

CFM = cubic feet per minute

PID = photoionization detector

NA = not available

NM = not measured

ppm = parts per million

°F = Degrees Fahrenheit

Sewer Air PID is a measurement taken from the Shunk Street Sewer air stream only.

The air stripper was taken off-line June 17, 2004; therefore the Total Flow PID is equal to the Sewer Air PID reading.

The system was operational for the reporting period.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: Shunk Street Sewer Biofilter System
pH Data

Fourth Quarter 2012

Date	Leachate pH	Biofilter Treatment Cell - Soil pH		
		Cell 1	Cell 2	Cell 3
26-Oct-12	NA	5.2	5.3	5.3
29-Nov-12	NA	5.1	5.1	5.1
20-Dec-12	5.25	5.38	5.45	5.26

Notes:

Leachate recordings are collected on a quarterly basis.

Media pH recordings are collected on a monthly basis.

NA = Not applicable or no leachate available for which to record pH.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
AOI 1: 26th Street Sewer Area

Fourth Quarter 2012

Date	Total Flow (gallons)	Period Total Flow (gallons)	Calculated System Flow Rate (gpm)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
5-Oct-12	39,831,471	10,213	1.42	NA	8,915.60
12-Oct-12	39,831,471	0	0.00	NA	8,916.60
19-Oct-12	39,840,994	9,523	0.94	NA	8,917.60
26-Oct-12	39,852,776	11,782	1.17	NA	8,918.60
2-Nov-12	39,860,519	7,743	0.77	NA	8,919.60
9-Nov-12	39,875,629	15,110	1.50	NA	8,920.60
16-Nov-12	39,886,493	10,864	1.08	NA	8,921.60
23-Nov-12	39,893,841	7,348	0.73	NA	8,922.60
30-Nov-12	39,900,397	6,556	0.65	NA	8,923.60
7-Dec-12	39,904,155	3,758	0.37	NA	8,924.60
14-Dec-12	39,904,155	0	0.00	NA	8,925.60
21-Dec-12	39,904,155	0	0.00	NA	8,926.60
31-Dec-12	39,904,155	0	0.00	NA	8,927.60

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallon per minute

The total flow and total LNAPL recovered includes historical totals from former recovery wells RW-400 through RW-406.

The 26th Street Sewer Area (26th Street North) Total Fluids Recovery System consists of 19 total fluids recovery wells which discharge directly to a benzene NESHAP controlled sewer; therefore, volume of recoverable LNAPL cannot be quantified. None of the 5 wells on CSX property were active during this reporting period due to absence of product.

Due to high iron content of the total fluids recovered, the pumps routinely become fouled and get hung up. During weekly visits, pumps are pulled, cleaned, and restarted regularly as needed. The system was operational for the reporting although the flow meter bypass was opened the second week of the period. The flow meter was found inoperable on December 6 and on December 14, it was bypassed pending replacement.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: 26th Street & Packer Avenue Sewers Biofilter System
Historical Organic Vapor Concentrations

Fourth Quarter 2012

Date	Biofilter Influent			Biofilter Effluent							
	Packer Ave. (ppm)	26 th Street (ppm)	ST-1 (Combined Influent) (ppm)	Cell-1N	Cell-1S	Cell-2N	Cell-2S	Cell-3N	Cell-3S	Cell-4N	Cell-4S
05-Oct-12	70.6	113.3	75.7	5.9	6.3	4.1	7.2	NA	NA	NA	NA
12-Oct-12	15.7	56.0	30.2	0.0	0.0	0.0	0.0	NA	NA	NA	NA
19-Oct-12	1.4	28.1	4.9	0.0	0.0	0.0	0.0	NA	NA	NA	NA
26-Oct-12	0.8	19.4	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA
02-Nov-12	22.3	21.8	16.5	0.0	0.0	0.0	0.0	NA	NA	NA	NA
09-Nov-12	17.1	50.7	17.7	0.0	0.0	0.0	0.0	NA	NA	NA	NA
16-Nov-12	11.2	9.4	8.8	0.0	0.0	0.0	0.0	NA	NA	NA	NA
23-Nov-12	0.5	13.0	3.7	0.0	0.0	0.0	0.0	NA	NA	NA	NA
30-Nov-12	6.1	18.3	9.7	0.0	0.0	0.0	0.0	NA	NA	NA	NA
07-Dec-12	31.3	42.0	27.2	0.0	0.0	0.0	0.0	NA	NA	NA	NA
14-Dec-12	1.6	38.4	14.5	0.0	0.0	0.0	0.0	NA	NA	NA	NA
21-Dec-12	36.5	41.0	21.6	0.0	0.0	0.0	0.0	NA	NA	NA	NA
31-Dec-12	13.9	46.1	22.7	0.0	0.0	0.0	0.0	NA	NA	NA	NA

NOTES: ppm: parts per million

Readings are collected using a ThermoEnvironmental Photoionization Detector (PID).

The system was operational throughout the reporting period. Beds 3 and 4 remain off for the reporting period as they are not currently needed for vapor treatment.

On November 19, 2012, the system was turned off due to a steam leak. The system was returned to service on November 20, 2012.

NA: Not applicable or not available

NM: Not measured

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: Shunk Street Sewer Biofilter System
pH Data

Fourth Quarter 2012

Date	Leachate pH	Biofilter Treatment Cell - Soil pH		
		Cell 1	Cell 2	Cell 3
26-Oct-12	NA	5.2	5.3	5.3
29-Nov-12	NA	5.1	5.1	5.1
20-Dec-12	5.25	5.38	5.45	5.26

Notes:

Leachate recordings are collected on a quarterly basis.

Media pH recordings are collected on a monthly basis.

NA = Not applicable or no leachate available for which to record pH.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Groundwater and LNAPL Recovery System Operational Data
AOI 2: Pollock Street West End System

Fourth Quarter 2012

Date	Period Total Flow (gallons)	Total Flow (gallons)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
1-Oct-12	0	6,251,005	196.9	42,260
12-Oct-12	348,300	6,599,305	364.3	42,624
19-Oct-12	235,800	6,835,105	611.4	43,236
26-Oct-12	241,000	7,076,105	621.4	43,857
2-Nov-12	242,400	7,318,505	493.7	44,351
5-Nov-12	104,800	7,423,305	206.0	44,557
12-Nov-12	245,500	7,668,805	432.0	44,989
19-Nov-12	113,500	7,782,305	0.0	44,989
26-Nov-12	246,000	8,028,305	371.8	45,361
27-Nov-12	33,800	8,062,105	31.5	45,392
3-Dec-12	200,800	8,262,905	93.8	45,486
10-Dec-12	244,000	8,506,905	163.7	45,650
21-Dec-12	274,928	8,781,833	561.9	46,212
31-Dec-12	183,056	8,964,889	163.7	46,375

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

NM: Not Measured

The total groundwater and total LNAPL recovery totals do not include historical totals from former Pollock Street Vertical System recovery wells. The West End system was started on February 23, 2012.

The system was operational throughout the reporting period although the flow meter was replaced on December 12 due to a damaged lower drive assembly.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
AOI 2: Pollock Street Vertical Wells

Fourth Quarter 2012

Date	RW-101			RW-102			RW-103		
	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	Average Flow Rate (gpm)	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	Average Flow Rate (gpm)	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	Average Flow Rate (gpm)
5-Oct-12	57,670	10,656,050	8.01	0	5,698,559	0.00	30,350	6,110,570	4.22
12-Oct-12	42,810	10,698,860	4.25	6,280	5,704,839	0.62	24,590	6,135,160	2.44
19-Oct-12	46,420	10,745,280	4.61	6,720	5,711,559	0.67	27,570	6,162,730	2.74
26-Oct-12	43,160	10,788,440	4.28	6,570	5,718,129	0.65	28,010	6,190,740	2.78
2-Nov-12	38,190	10,826,630	3.79	8,330	5,726,459	0.83	11,550	6,202,290	1.15
9-Nov-12	29,310	10,855,940	2.91	4,890	5,731,349	0.49	16,510	6,218,800	1.64
16-Nov-12	40,970	10,896,910	4.06	6,030	5,737,379	0.60	27,560	6,246,360	2.73
23-Nov-12	28,900	10,925,810	2.87	5,830	5,743,209	0.58	22,110	6,268,470	2.19
30-Nov-12	36,780	10,962,590	3.65	5,650	5,748,859	0.56	22,030	6,290,500	2.19
7-Dec-12	29,780	10,992,370	2.95	1,650	5,750,509	0.16	14,440	6,304,940	1.43
14-Dec-12	32,200	11,024,570	3.19	5,460	5,755,969	0.54	24,520	6,329,460	2.43
21-Dec-12	33,270	11,057,840	3.30	5,140	5,761,109	0.51	21,460	6,350,920	2.13
31-Dec-12	50,210	11,108,050	3.49	6,550	5,767,659	0.45	33,280	6,384,200	2.31

NOTES:

gpm: gallons per minute

The Pollock Street Sewer Area Vertical System (RW-101, RW-102, and RW-103) discharges total fluids directly to a benzene NESHAP controlled sewer; therefore, recovered LNAPL volume cannot be calculated. The reported volume recovered for total fluids accounts for the historical recovery for each system.

The vertical wells were operational for the reporting period except the flow meter at RW-102 was reinstalled on October 2 following an October 1 line repair. On October 31, the flow meter at RW-103 was inoperable, repaired, and reinstalled. On December 4, the RW-101 water pump was replaced.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
AOI 2: Pollock Street Horizontal Wells

Fourth Quarter 2012

Actual Dates in Period	Reporting Period (Internal)	Days in Period	HW-1 Days of Operation Within Period	HW-1 Water Recovered During Period (gallons)	HW-2 Days of Operation Within Period	HW-2 Water Recovered During Period (gallons)	HW-3 Days of Operation Within Period	HW-3 Water Recovered During Period (gallons)	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	LNAPL Recovered During Period (gallons)
1/1/12 - 1/20/12	start 1Q2012	20	2	23,040	2	10,742	20	442,944	476,726	21,534,898	NA
12/24/11 - 1/20/12	Jan. 2012	28	10	115,200	10	53,712	28	620,122	789,034	21,534,898	NA
1/21/12 - 2/17/12	Feb. 2012	28	25	288,000	24	128,909	28	620,122	1,037,030	22,571,928	NA
2/18/12 - 3/16/12	March 2012	28	27	311,040	28	150,394	27	597,974	1,059,408	23,631,336	NA
3/17/12 - 3/30/12	end 1Q2012	14	13	149,760	14	75,197	14	310,061	535,018	24,166,354	NA
3/17/12 - 4/20/12	April 2012	35	34	391,680	35	187,992	34	753,005	1,332,677	24,964,013	NA
4/21/12 - 5/18/12	May 2012	28	27	311,040	28	150,394	28	620,122	1,081,555	26,045,568	NA
5/19/12 - 6/22/12	June 2012	35	33	380,160	32	171,878	23	509,386	1,061,424	27,106,992	NA
6/23/12 - 6/30/12	end 2Q2012	8	8	92,160	8	42,970	8	177,178	312,307	27,419,300	NA
6/23/12 - 7/20/12	July 2012	28	28	322,560	28	150,394	28	620,122	1,093,075	28,200,068	NA
7/21/12 - 8/24/12	Aug. 2012	35	35	403,200	35	187,992	35	775,152	1,366,344	29,566,412	NA
8/25/12 - 9/21/12	Sept. 2012	28	28	322,560	28	150,394	28	620,122	1,093,075	30,659,487	NA
9/22/12 - 9/30/12	end 3Q2012	9	9	103,680	9	48,341	9	199,325	351,346	31,010,832	NA
9/22/12 - 10/19/12	Oct. 2012	28	27	311,040	27	145,022	28	620,122	1,076,184	31,735,671	NA
10/20/12 - 11/16/12	Nov. 2012	28	26	299,520	28	150,394	28	620,122	1,070,035	32,805,706	NA
11/17/12 - 12/21/12	Dec. 2012	35	35	403,200	33	177,250	35	775,152	1,355,602	34,161,308	NA
12/22/12 - 12/31/12	end 4Q2012	10	9	103,680	10	53,712	10	221,472	378,864	34,540,172	NA

NOTES:

Pump tests were performed in March 2011 for the horizontal wells so that recovered volumes could be estimated based on flow rates and system up-time, beginning in the second quarter of 2011. HW-1 estimated flow is 8 gallons per minute (gpm), HW-2 is 3.73 gpm, and HW-3 is 15.38 gpm.

HW-1 was operational for the reporting period except for December 27 when blown diaphragms were replaced and the pump was reinstalled.

HW-2 was operational for the reporting period.

HW-3 was operational for the reporting period.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Groundwater and LNAPL Recovery System Operational Data
AOI 6: 27 Pump House

Fourth Quarter 2012

Date	Water Recovered During Period (gallons)	Total Water Extracted (gallons)	Average Flow Rate (gpm)	LNAPL Recovered During Period (gallons)	Total LNAPL Recovered (gallons)
05-Oct-12	0	11,134,675	0.00	2.00	12,870.70
12-Oct-12	0	11,134,675	0.00	2.00	12,872.70
19-Oct-12	0	11,134,675	0.00	1.00	12,873.70
26-Oct-12	0	11,134,675	0.00	1.50	12,875.20
02-Nov-12	0	11,134,675	0.00	1.50	12,876.70
09-Nov-12	0	11,134,675	0.00	0.00	12,876.70
16-Nov-12	0	11,134,675	0.00	1.50	12,878.20
23-Nov-12	0	11,134,675	0.00	0.75	12,878.95
30-Nov-12	0	11,134,675	0.00	1.00	12,879.95
07-Dec-12	0	11,134,675	0.00	1.00	12,880.95
14-Dec-12	0	11,134,675	0.00	0.75	12,881.70
21-Dec-12	0	11,134,675	0.00	0.50	12,882.20
31-Dec-12	0	11,134,675	0.00	0.00	12,882.20

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallons per minute

The system was turned off September 20, 2010 due to absence of recoverable product. Recovery wells B-124, B-137, B-139, B-142, and B-143 contained absorbent socks. Absorbent socks were placed in B-132 and B-147 on October 10, 2012. During the reporting period, wells were routinely gauged and the socks were replaced when necessary. LNAPL recovery volumes are recorded using a graduated beaker and recovered product is transferred to the system holding tank. Passive remediation will continue until no measurable product is observed or until recoverable thicknesses of LNAPL return to the recovery wells.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
3 Separator System

Fourth Quarter 2012

Date	Total Flow (gallons)	Period Total Flow (gallons)	Calculated System Flow Rate (gpm)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
10/05/2012	987,985	66,000	9.17	542.9	4,586.8
10/12/2012	1,148,085	160,100	15.88	433.1	5,019.8
10/15/2012	1,208,185	60,100	13.91	1,064.7	6,084.5
10/16/2012	1,229,085	20,900	14.51	363.0	6,447.6
10/19/2012	1,283,485	54,400	12.59	826.8	7,274.4
10/22/2012	1,334,785	51,300	11.88	691.9	7,966.3
10/26/2012	1,400,385	65,600	11.39	611.7	8,578.0
11/02/2012	1,515,785	115,400	11.45	764.7	9,342.7
11/12/2012	1,676,485	160,700	11.16	475.9	9,818.5
11/19/2012	1,774,085	97,600	9.68	0.0	9,818.5
11/26/2012	1,867,185	93,100	9.24	706.1	10,524.6
11/27/2012	1,879,485	12,300	8.54	66.9	10,591.5
12/03/2012	1,956,985	77,500	8.97	277.2	10,868.6
12/11/2012	2,056,885	99,900	8.67	357.5	11,226.1
12/21/2012	2,179,285	122,400	8.50	359.8	11,586.0
12/31/2012	2,257,985	78,700	5.47	221.5	11,807.5

Notes:

gpm: gallons per minute

LNAPL: Light Non-Aqueous Phase Liquid

The 3 Separator System is a hydraulic control system constructed of ten recovery wells which was started on August 23, 2012. LNAPL and water are extracted using pneumatic submersible pumps and total fluids pass through an oil water separator. Water is discharged to an onsite process sewer and LNAPL is recovered in a tank and recycled by the refinery. Groundwater and product recovery totals provided include system startup through the end of this reporting period.

The system was operational for the reporting period with the following exceptions. On October 8 the system was on tank full alarm so the holding tank was evacuated and the system restarted. The system was off October 9 through 11 due to a heater malfunction. On November 12, the air line to RW-806 was found off; it was reattached and the pump was restarted the same day.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 8: Jackson Street Sewer Water Curtain

Fourth Quarter 2012

Date	PID readings (ppm)			Comments
	Blower	Water Curtain	Interceptor Chamber	
05-Oct-12	NA	0.0	0.0	
12-Oct-12	NA	0.0	0.0	
19-Oct-12	NA	0.0	0.0	
26-Oct-12	NA	0.0	0.0	
02-Nov-12	NA	0.0	0.0	
09-Nov-12	NA	0.0	0.0	
16-Nov-12	NA	0.0	0.0	
23-Nov-12	NA	0.0	0.0	
30-Nov-12	NA	0.0	0.0	
07-Dec-12	NA	0.0	0.0	
14-Dec-12	NA	0.0	0.0	
21-Dec-12	NA	0.0	0.0	
31-Dec-12	NA	0.0	0.0	

Notes:

ppm: parts per million

NA: Not Available (PID readings are not collected at the blower.)

The totalizer was removed on December 11, 2009.

The system was operational throughout the reporting period.

ATTACHMENT 2
26th Street South (S-50 Area) Report



**PERFORMANCE MONITORING AND QUARTERLY UPDATE
26TH STREET SOUTH (AOI-1)**

**SUNOCO, INC (R&M)
PHILADELPHIA REFINERY
PHILADELPHIA, PA**

January 2013

Prepared for:

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Prepared by:

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Prepared By:

A handwritten signature in black ink, appearing to read "Tiffani L. Doerr".

Tiffani L. Doerr, P.G.
Senior Hydrogeologist

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FIGURES

- Figure 1 Groundwater Monitoring Map
 Figure 2 Injection Well Location Map

TABLE

- Table 1 Historic Groundwater Gauging and Sampling Summary
 Table 2 Summary of Field Monitoring Parameters
 Table 3a DO Data for Shallow Injection Wells
 Table 3b DO Data for Deep Injection Wells
 Table 4a ORP Data for Shallow Injection Wells
 Table 4b ORP Data for Deep Injection Wells

APPENDICES

- Attachment A Groundwater Laboratory Analytical Data
 Attachment B DO Graphs for System Injection Points
 Attachment C DO, Benzene and Groundwater Elevation vs Time Graphs



1.0 INTRODUCTION

The information contained in this report is intended to be included as an Attachment to the Quarterly Remediation Status Report for the Philadelphia Refinery and Belmont Terminal prepared by Stantec. The area investigated by Aquaterra and summarized in this report includes the southern portion of AOI-1, also known as the #2 Tank Farm or the 26th Street South area. Historic sampling of groundwater in this area had been sporadic; however, over the course of the sampling history relatively high occurrences of benzene have been reported. Therefore, Aquaterra has been performing quarterly sampling of select monitoring wells across the area to provide further definition of the extent of the light non-aqueous phase liquids (LNAPL) and dissolved phase constituents of concern (COCs) in groundwater. This report also provides a summary of the remediation system operation, maintenance, and sampling activities.

2.0 QUARTERLY GROUNDWATER SAMPLING

2.1 Sampling Methodology

On 18 October 2012, select monitoring wells within the 26th Street South study area were gauged and sampled as part of a quarterly groundwater monitoring program. Prior to sampling, depth to water measurements were collected for use in calculating groundwater elevations and for the generation of a groundwater gradient map (**Figure 1**). Depths to water ranged from 16.91 (S-127) to 26.64 (S-209) feet below top of casing. The groundwater gradient map illustrates groundwater flow toward the southeast. LNAPL was measured in three wells during the gauging event. Well S-210 measured an LNAPL thickness of 0.03 feet, S-226 measured an LNAPL thickness of 0.09 feet, and S-231 measured a thickness of 0.21 feet; therefore samples were not collected from these wells for laboratory analysis. Groundwater samples were collected from wells S-50, S-230, and S-232. Groundwater gauging information collected as part of the groundwater sampling event is summarized in **Table 1**.

Sampling of wells was performed using the three well volume purge protocol for groundwater sampling using a whale pump. Samples were submitted to Lancaster Laboratories, Inc. (Lancaster) for analysis of the following COCs: benzene, toluene, ethylbenzene, xylenes (BTEX), and methyl tertiary-butyl ether (MTBE) via US EPA Method 8260B. Laboratory analytical data and chain of custody are included as **Attachment A**.

2.2 Sampling Results

Laboratory data indicate that benzene was reported above the Pennsylvania Department of Environmental Protection (PADEP) Act 2 Statewide Health Standard (SHS) Medium Specific Concentration (MSC) in the three wells that were sampled. All other compounds were reported below their respective SHS MSCs. Laboratory data are summarized in **Table 1**.



3.0 REMEDIATION ACTIVITIES

3.1 Oxygen Injection System

Between January and March 2009, 54 nested injection points within 27 well boreholes (at each well location there is one shallow and one deep) were installed as part of the oxygen injection remediation system. Deep injection points range in depth from 29 to 41 feet below grade, and shallow injection points range in depth from 25 to 33.5 feet below grade, each with two feet of slotted screen. The nested configuration was utilized due to aquifer heterogeneity and the presence of clay layers which may inhibit the movement of oxygen to the impacted zones. The goal of the remediation system is to provide a barrier against offsite migration of the COCs within the aquifer.

Four ‘banks’ of wells were set to inject into multiple wells at a time so that oxygen is pulsed into the aquifer. This pulsing of the system aids in transfer of oxygen from the vapor to dissolved phase, and the low flow rate allows for maximum dissolved oxygen (DO) saturation without causing contaminant volatilization. The system was initially set up to only inject within the deep points (except at IW-01, where there was blockage in the deep point); however, due to lower than projected target DO concentrations in surrounding monitoring wells, the system was adjusted on 18 November 2009 to inject into the shallow points so that DO injection was being performed closer to the monitoring well screen intervals. Initially, injection wells IW-17, IW-18 and IW-19 remained as deep injection points due to the deeper well screen construction of S-232. However, on 6 April 2012, injection was switched from IW-18D to IW-18S due to blockage in the deep point. On 14 January 2010, IP-25 was switched back to the deep well due to loss of pressure in the shallow well. Injection well locations are illustrated on **Figure 2**.

3.2 Operation and Maintenance

Routine operation and maintenance (O&M) activities are generally conducted by Aquaterra on a monthly basis, during which Aquaterra records system operation information including system run time and operating pressures. Adjustments are made during each visit to maintain optimal operating conditions. Injection pressures are measured at each point during these visits and adjusted to approximately 30 standard cubic feet per hour (scfh). Oxygen purity is also measured during each visit. O&M visits were conducted on 17 October 2012, 27 November 2012, and 31 December 2012. During each O&M visit, the system was down upon arrival due to issues with the air dryer being frozen. Each time the dryer was fixed and the system restarted. However, permanent repairs or replacement needs to be made.

DO and ORP measurements are also collected during each O&M visit from injection points as well as nearby monitoring wells (S-50, S-210, S-226, S-230, S-231 and S-232). The pH, depth to water, and thickness of LNAPL, if present, are also recorded from the monitoring wells proximal to the system (**Table 2**). During each of the monthly O&M visits, LNAPL was recorded in wells S-210, S-226, and S-231. LNAPL thickness ranged from 0.05 feet in S-210, from 0.05 to 0.08 feet in S-226, and from 0.02 to 0.08 feet in S-231.

Due to the large number of injection points, half of the points are measured for DO and ORP concentrations during each by-weekly visit. DO data are presented in **Tables 3a and 3b** for the shallow and deep injection points, respectively. ORP data are presented in **Tables 4a and 4b** for the shallow and deep injection points, respectively. The DO data is also presented graphically for

the shallow and deep wells. A ‘goal line’ of 2 milligrams per liter (mg/L) is presented on the graphs to illustrate where aerobic conditions exist. The 30 mg/L line is also illustrated on the graphs for each well as this is the goal concentration for wells in which oxygen is being injected. These graphs are included in **Attachment B**.

3.3 Annual Groundwater Sampling

In addition to the sampling activities summarized in Section 2.1, six groundwater monitoring wells proximal to the remediation system are sampled for additional parameters to aid in determining if aerobic conditions are maintained and if there is a reduction in the benzene concentrations and other COCs in the surficial aquifer. The select wells are sampled for natural attenuation parameters and microbial analyses. Generally when monitoring for these parameters, wells upgradient of the plume, within the plume and downgradient of the plume are monitored so that spatial analysis of the results can be performed. However, as the system provides a barrier along the downgradient property boundary, no downgradient wells are available for monitoring. Therefore, the following wells are sampled to provide information both within and outside of the plume, as defined by the high benzene concentrations. The wells include: S-50, S-52, S-117, S-226, S-231, and S-232.

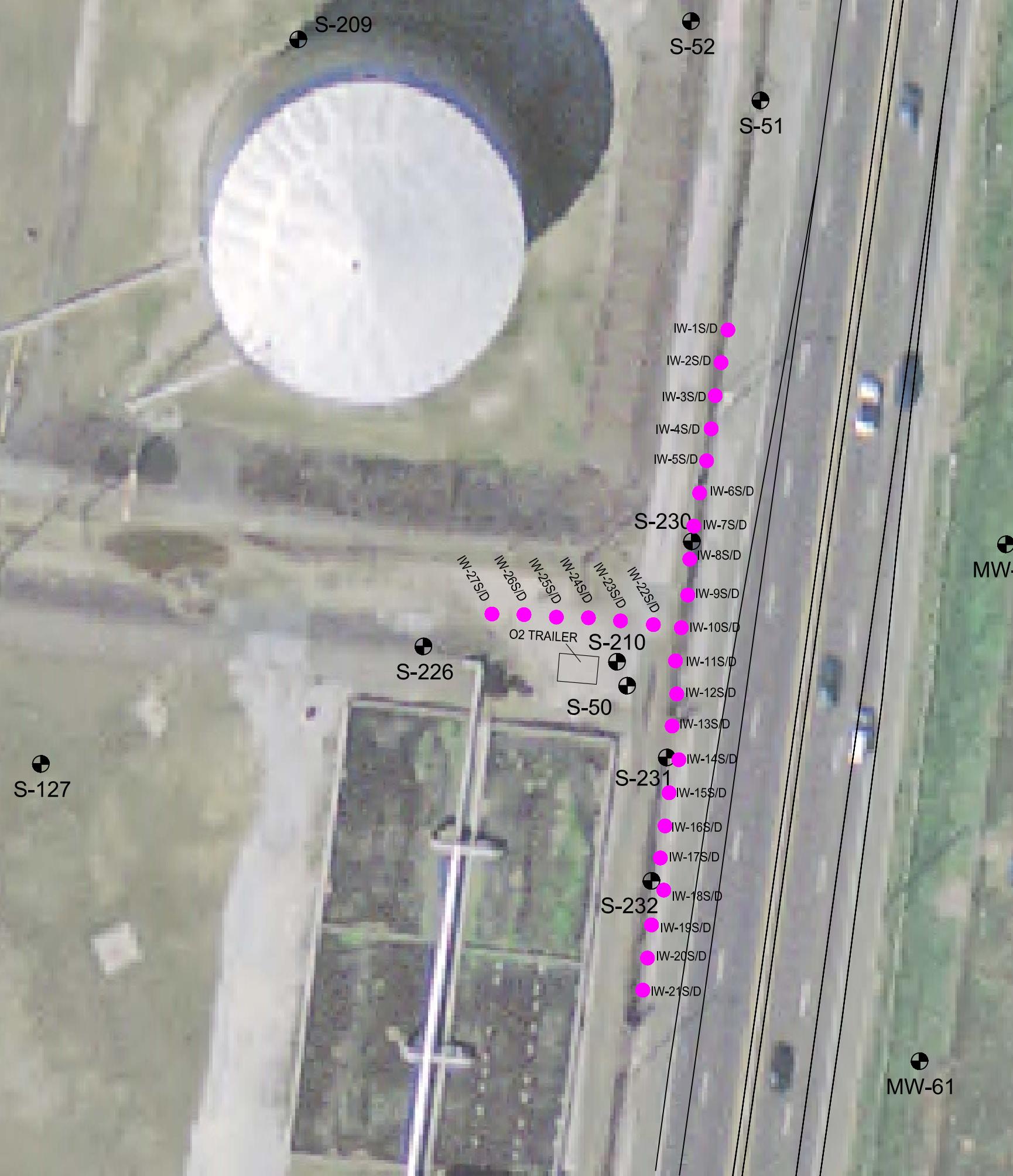
The wells were initially sampled on a quarterly basis; however, the quarterly sampling was reduced to an annual schedule. The wells were last sampled during the second quarter of 2012. Sample parameters include: DO, ORP, pH, conductivity, and temperature (all with field probe using flow-through cell); carbon dioxide (CO₂) using a field meter; alkalinity, ferrous iron, nitrate/nitrite, sulfate, total dissolved solids (TDS), total organic carbon (TOC), total inorganic carbon (TIC), biochemical oxygen demand (BOD), and hydrocarbon degrading bacteria including heterotrophic plate count via laboratory analyses.

In addition to the annual sampling, some of these wells are monitored for DO, ORP, and pH during the O&M visits as noted in Section 3.2. These field parameters are provided in **Table 2**. Graphs were generated illustrating the natural log of benzene concentration, versus groundwater elevation and DO concentration in each of the six wells nearest the remediation system (**Attachment C**). Product thicknesses are also added to these graphs since field measurements cannot be collected in the presence of LNAPL.

3.4 Future Sampling Activities

The quarterly schedule of groundwater sampling will continue for the wells noted in Section 2.1. The select wells utilized for monitoring of attenuation parameters and microbial analysis (as discussed in Section 3.3) will continue to be sampled on an annual basis. They will be sampled again in the second quarter of 2013. As noted in the previous report, Stantec continues to monitor and sample select wells along the property boundary as part of their annual perimeter sampling program, which includes wells S-41, S-43, S-44, S-50, S-51, S-226, and S-232.





LEGEND

● MONITORING WELL

● INJECTION POINT LOCATION

DRAFTED BY:
BB

CHECKED BY:
TD

REVIEWED BY:
TD

NORTH

OXYGEN INJECTION WELL LOCATION
MAP

SUNOCO PHILADELPHIA REFINERY
26TH STREET SOUTH - S-50 AREA
PHILADELPHIA, PENNSYLVANIA

AQUATERRA TECHNOLOGIES, INC.
122 S. CHURCH ST, WEST CHESTER, PA 19381

SCALE: 1"=50' DATE: 4-27-2009 FIGURE 2



0' 50'

TABLE 1
Groundwater Gauging and Sampling Summary
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	Total Depth	DTW	DTP	SPH Thickness	GW Elev	Benzene ug/l	Toluene ug/l	Ethyl-benzene ug/l	Total Xylenes ug/l	MTBE ug/l	Isopropylbenzene ug/l	Naphthalene ug/l	1,2-Dibromoethane (EDB) ug/l	1,2-Dichloroethane (EDC) ug/l	Dissolved Lead mg/l	Fluorene ug/l	Phenanthrene ug/l	Chrysene ug/l	Pyrene ug/l	Sulfate mg/l	Nitrate Nitrogen mg/l	Nitrite Nitrogen mg/l	Organic Carbon (total) mg/l	Inorganic Carbon (total) mg/l	Total Carbon mg/l	Alkalinity ¹ (pH 4.5) mg/l as CaCO ₃	Alkalinity ² (pH 8.3) mg/l as CaCO ₃	Dissolved solids (total) mg/l	Ferrous Iron mg/l	Biochemical Oxygen Demand mg/l	HC Bacteria in Water cfu/ml	Heterotrophic Plate Count cfu/ml
S-41	6/10/2008	25.75	36	25.74	-	-	0.01	13	5	<1	3	43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	3/27/2009			26.51	-	-	-0.76	44	7	12	28	20	98	<5	<0.030	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/23/2009			25.81	-	-	-0.06	15	3	4	4	45	100	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	9/16/2009			25.37	-	-	0.38	37	11	<5	6	28	46	<5	<0.029	<5	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	12/9/2009			24.76	-	-	0.99	12	5	2	5	40	29	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/18/2012			26.03	-	-	-0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
S-42I	6/10/2008	25.72	68	25.41	-	-	0.31	1	<1	<1	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	3/27/2009			26.11	-	-	-0.39	25	2	7	19	11	<2	<5	<0.032	3	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/23/2009			25.41	-	-	0.31	6	<1	<1	2	14	<2	<5	<0.029	4	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	9/16/2009			24.98	-	-	0.74	78	20	2	10	<1	<1	<2	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
	12/9/2009			24.43	-	-	1.29	29	<1	<1	<1	<1	<2	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NN			
S-43	9/14/2007	23.32	35	-	-	-	-	1,200	69	320	220	<10	NA	NA	NA	NA	NA	NA	NA	NA	<0.50	NA	8.6	NA	NA	NA	NA	326	NA	16.8	<100	3,500		
	10/24/2007			24.04	-	-	-0.72	930	46	180	130	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/10/2008			24.78	-	-	-1.46	1,300	98	370	290	5	42	71	<0.030	<2	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	3/27/2009			24.11	-	-	-0.79	1,600	90	520	350	7	52	110	<0.029	<5	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	9/16/2009			23.71	-	-	-0.39	590	34	140	100	<5	26	32	<0.029	<5	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	12/9/2009			22.87	-	-	0.45	220	21	110	92	1	19	21	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
S-44	9/14/2007	23.48	40	-	-	-	-	1,100	24	28	58	210	NA	NA	NA	NA	NA	NA	NA	NA	<0.50	NA	35.5	NA	NA	NA	NA	454	NA	34.1	<100	7,800		
	10/24/2007			-	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/10/2008			25.64	-	-	-2.16	1,000	23	16	33	260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	3/27/2009			26.25	-	-	-2.77	620	22	25	65	310	23	<5	<0.030	<1	<0.1	<5	5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	9/16/2009			25.70	-	-	-2.22	1,300	27	18	37	290	37	<5	<5	<5	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	12/9/2009			25.33	-	-	-1.85	2,300	130	40	110	250	59	<5	<0.030	<10	<1.0	5	5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
S-45	6/11/2008	21.57	24	22.92	-	-	-1.35	11	2	<1	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NA			
	3/27/2009			22.90	-	-	-1.33	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry			
	6/23/2009			14.68	-	-	6.89	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry	NS-Dry			
	9/16/2009			21.61	-	-	-0.04	23	2	1	2	1	<1	<4	<1	<1	<4	<1	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			
	12/9/2009			22.87	-	-	-1.30	<1	<1	<1	<1	<1	<1	<5	<0.029	<20	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			
	6/18/2012			22.88	-	-	-1.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
S-46	6/12/2008	22.61	33	21.44	-	-	1.17	77	25	52	46	63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	3/27/2009			22.38	-	-	0.23	4																										

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26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	Total Depth	DTW	DTP	SPH Thickness	GW Elev	Benzene ug/l	Ethylbenzene ug/l	Total Xylenes ug/l	MTBE ug/l	Isopropylbenzene ug/l	Naphthalene ug/l	1,2-Dibromoethane (EDB) ug/l	1,2-Dichloroethane (EDC) ug/l	Dissolved Lead mg/l	Fluorene ug/l	Phenanthrene ug/l	Chrysene ug/l	Pyrene ug/l	Sulfate mg/l	Nitrate Nitrogen mg/l	Nitrite Nitrogen mg/l	Organic Carbon (total) mg/l	Inorganic Carbon (total) mg/l	Total Carbon mg/l	Alkalinity ¹ (pH 4.5) mg/l as CaCO ₃	Alkalinity ² (pH 8.3) mg/l as CaCO ₃	Dissolved solids (total) mg/l	Ferrous Iron mg/l	Biochemical Oxygen Demand mg/l	HC Bacteria in Water cfu/ml	Heterotrophic Plate Count cfu/ml	
S-52	6/11/2008	23.54	40	23.27	-	-	0.27	12	<5	<5	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	3/25/2009			23.90	-	-	-0.36	280	3	7	18	1,500	24	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	5/7/2009			23.52	-	-	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5.0	<0.10	<0.050	24.3	NA	NA	337	<0.20	426	13.8	12.5	<100	2,000				
	6/22/2009			23.12	-	-	0.42	44	2	<1	2	1,300	23	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	9/16/2009			22.76	-	-	0.78	51	3	<1	3	1,200	32	<5	<0.029	<1	<1.0	<5	<5	<5	<5	<5.0	<0.10	<0.050	24.1	NA	NA	338	<2.0	430	24.7	13.5	600	4,800
	12/10/2009			22.45	-	-	1.09	21	3	1	3	1,100	33	<5	<0.029	<1	<1.0	<5	<5	<5	<5	<5.0	<0.10	<0.050	28.8	137	166	343	<2.0	414	31.8	11.7	100	80
	3/17/2010			22.38	-	-	1.16	4	2	<1	2	930	18	<4	NA	NA	NA	NA	NA	NA	<5.0	<0.10	<0.050	24.5	115	139	356	<2.0	455	28.9	13.7	<100	360	
	6/1/2010			22.41	-	-	1.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	240				
	3/14/2011			23.49	-	-	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	5/16/2011			22.91	-	-	0.63	14	27	<1	6	320	NA	NA	NA	NA	NA	NA	NA	NA	NA	60.1	<0.10	<0.050	29	125	155	364	<2.0	526	24.1	14.7	<100	110
	7/21/2011			23.17	-	-	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	3/2/2012			22.86	-	-	0.68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	6/18/2012			23.30	-	-	0.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	8/9/2012			23.46	-	-	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	10/18/2012			23.49	-	-	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
S-95	6/10/2008	22.99	31	22.47	-	-	0.52	<1	<1	<1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	3/27/2009			23.19	-	-	-0.20	6	2	<1	5	3	94	<5	<0.030	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/23/2009			22.55	-	-	0.44	18	2	2	7	4	96	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	9/16/2009			22.10	-	-	0.89	6	2	<1	4	3	100	<5	<0.029	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	12/9/2009			21.58	-	-	1.41	2	<1	<1	2	2	32	<5	<0.030	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/18/2012			22.66	-	-	0.33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
S-117	8/6/2008	18.41	29	17.20	-	-	1.21	7,400	43	900	69	89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	3/25/2009			18.12	-	-	0.29	250	6	<1	16	20	12	9	<0.030	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	5/7/2009			17.58	-	-	0.83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	125	<0.10	0.062	6.4	NA	NA	98.8	<2.0	281	25.3	9.4	<1000	78,000	
	6/23/2009			17.34	-	-	1.07	300	6	74	12	31	10	20	<0.029	<1	<1.0	<5	<5	<5	<5	65.6	<0.10	0.053	10.1	NA	NA	182	<2.0	305	33.6	7.1	<100	2,800
	9/16/2009			16.88	-	-	1.53	370	<5	14	9	6	<10	<5	<0.029	<5	<1.0	<5	<5	<5	<5	8.2	<1.0	<0.050	5.8	46.5	52.3	107	<2.0	128	17.9	7.8	<100	1,900
	12/10/2009			16.29	-	-	2.12	47	2	49	3	2	14	14	<0.029	<1	<1.0	<5	<5	<5	<5	32.3	<0.10	<0.050										

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26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



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26th Street South Area (AOI-1)
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Well ID	Sample Date	Casing Elev (feet)	Total Depth	DTW	DTP	SPH Thickness	GW Elev	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Total Xylenes ug/l	MTBE ug/l	Isopropylbenzene ug/l	Naphthalene ug/l	1,2-Dibromoethane (EDB) ug/l	1,2-Dichloroethane (EDC) ug/l	Dissolved Lead mg/l	Fluorene ug/l	Phenanthrene ug/l	Chrysene ug/l	Pyrene ug/l	Sulfate mg/l	Nitrate Nitrogen mg/l	Nitrite Nitrogen mg/l	Organic Carbon (total) mg/l	Inorganic Carbon (total) mg/l	Total Carbon mg/l	Alkalinity ¹ (pH 4.5) mg/l as CaCO ₃	Alkalinity ² (pH 8.3) mg/l as CaCO ₃	Dissolved solids (total) mg/l	Ferrous Iron mg/l	Biochemical Oxygen Demand mg/l	HC Bacteria in Water cfu/ml	Heterotrophic Plate Count cfu/ml
S-230	9/14/2007	20.19	32	-	-	-	-	2,600	<5	32	64	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20.7	NA	NA	NA	NA	406	NA	174	<1000	30,000		
	10/24/2007			-	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	6/11/2008			19.70	-	-	0.49	990	<5	17	34	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	3/25/2009			20.63	-	-	-0.44	8,000	<20	51	52	<20	<40	14	<0.029	<20	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	5/7/2009			18.70	-	-	1.49	400	<1	2	5	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	6/23/2009			18.65	-	-	1.54	1,200	6	23	23	<2	5	<50	<0.030	<2	<1.0	<50	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	7/21/2009			19.78	-	-	0.41	1,900	120	12	41	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	8/18/2009			19.65	-	-	0.54	1,000	3	11	15	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	9/16/2009			18.81	-	-	1.38	340	2	8	10	<1	6	<50	<0.029	<1	<1.0	<50	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
	10/22/2009			20.39	-	-	-0.20	490	9	12	37	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	11/25/2009			19.29	-	-	0.90	540	8	7	17	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	12/10/2009			20.91	-	-	-0.72	620	4	16	1	3	<5	<0.029	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	3/17/2010			16.57	-	-	3.62	230	2	8	11	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	6/1/2010			20.07	-	-	0.12	610	3	19	17	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	9/7/2010			20.51	-	-	-0.32	800	5	11	10	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	11/9/2010			19.60	-	-	0.59	51	<1	3	3	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	3/14/2011			17.55	-	-	2.64	14	10	<1	2	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	5/16/2011			19.33	-	-	0.86	81	28	<1	3	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	7/21/2011			20.38	-	-	-0.19	8,700	13	63	44	11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	12/21/2011			18.67	-	-	1.52	85	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	3/2/2012			18.84	-	-	1.35	310	6	<2	3	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	6/18/2012			20.27	-	-	-0.08	3,800	10	15	10	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	8/9/2012			20.74	-	-	-0.55	3,900	<10	10	<10	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	10/18/2012			21.01	-	-	-0.82	57,000	98	180	140	44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
S-231	9/14/2007	19.94	28	-	-	-	-	8,000	270	120	690	<20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19.5				
	10/24/2007			20.18	-	-	-0.24	33,000	170	280	1,100	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15,000					
	6/12/2008			20.84	-	-	-0.90	60,000	<200	400	1,100	<200	70	<400	<200	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	3/25/2009			20.84	-	-	0.05	42,000	84	75	640	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	5/7/2009			19.89	-	-	-0.25	42,000	84	75	640	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	6/22/2009			19.22	-	-	0.72	28,000	<50	140	600	<50	<100	NA	<0.029	<50	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200,000					
	7/21/2009			20.19	-	-	-0.25	31,000	67	190	750	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
	8/18/2009																																	

TABLE 1
Groundwater Gauging and Sampling Summary
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery

Well ID	Sample Date	Casing Elev (feet)	Total Depth	DTW	DTP	SPH Thickness	GW Elev	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Total Xylenes ug/l	MTBE ug/l	Isopropylbenzene ug/l	Naphthalene ug/l	1,2-Dibromoethane (EDB) ug/l	1,2-Dichloroethane (EDC) ug/l	Dissolved Lead mg/l	Fluorene ug/l	Phenanthrene ug/l	Chrysene ug/l	Pyrene ug/l	Sulfate mg/l	Nitrate Nitrogen mg/l	Nitrite Nitrogen mg/l	Organic Carbon (total) mg/l	Inorganic Carbon (total) mg/l	Total Carbon mg/l	Alkalinity ¹ (pH 4.5) mg/l as CaCO ₃	Alkalinity ² (pH 8.3) mg/l as CaCO ₃	Dissolved solids (total) mg/l	Ferrous Iron mg/l	Biochemical Oxygen Demand mg/l	HC Bacteria in Water cfu/ml	Heterotrophic Plate Count cfu/ml
S-255	6/10/2008	21.91	38	22.88	-	-	-0.97	390	17	120	260	58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	3/27/2009			23.52	-	-	-1.61	67	7	120	130	4	11	18	<0.030	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/23/2009			18.52	-	-	3.39	1	<1	3	17	<1	9	<5	<0.029	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	9/16/2009			22.33	-	-	-0.42	47	10	24	37	<1	2	<5	<0.030	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	12/9/2009			15.65	-	-	6.26	79	6	35	70	4	7	0.03	<1	<1.0	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	6/18/2012			22.96	-	-	-1.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
PADEP Act 2 SHS MSC (non-res):						5	1,000	700	10,000	20	3,500	100	0.05	5	5	1,900	1,100	1.9	130	-	-	-	-	-	-	-	-	-	-	-	-			

¹ Alkalinity (pH 4.5) equivalent to Total Alkalinity analysis starting 6/18/12

² Alkalinity (pH 8.3) equivalent to Phenolphthalein Alkalinity analysis starting 6/18/12

DTW = depth to water (measured from top of inner casing)

DTP = depth to product if present (measured from top of inner casing)

Total Depth = Depth to bottom of well (measured from top of inner casing)

NS-Dry = Not Sampled. Dry can also mean insufficient volume of water to sample.

<# = Concentration less than the laboratory limit of quantitation (LOQ)

PADEP Act 2 SHS MSC = Pennsylvania Department of Environmental Protection Act 2 Statewide Health Standard Medium

Specific Concentrations based on used aquifer, non-residential, total dissolved solids ≤2,500.

Shaded cells indicate concentrations greater than the SHS MSC.

Through 2009: Select wells sampled on a monthly basis for BTEX & MTBE only (S-50, S-210, S-226, S-230, S-231, S-232). Select wells sampled on a quarterly basis for all parameters shown (S-50, S-52, S-117, S-226, S-231, S-232).

Beginning in 2010: Eight wells (S-50, S-52, S-117, S-226, S-231, S-232) sampled on a quarterly basis; six for BTEX, MTBE and bio/chem parameters; two (S-210, S-230) for BTEX & MTBE only.

*Measurement assumed to be erroneously high - well re-gauged two days later and confirmed with bailer to be closer to second reading.

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conductivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-50	3/23/09	22.48	23.08	-	-	-0.60	NM	0.71	-69.4	NM	NM	7.63
	4/1/09	NM	-	-	-	NM	NM	1.25	-49	NM	NM	NM
	4/15/09	NM	-	-	-	NM	NM	3.05	-55	NM	NM	NM
	4/22/09	NM	-	-	-	NM	NM	NM	-50	NM	NM	NM
	5/7/09	22.62	-	-	-0.14	NM	1.58	-66	NM	512	6.3	
	5/21/09	NM	-	-	-	NM	NM	1.97	NM	NM	NM	NM
	6/4/09	NM	-	-	-	NM	NM	0.85	-61	NM	NM	NM
	6/23/09	22.33	-	-	0.15	NM	0.30	-116.7	0.920	280	6.52	
	7/8/09	22.49	-	-	-0.01	NM	0.70	-114	NM	NM	6.2	
	7/21/09	22.62	-	-	-0.14	NM	0.67	-128	NM	NM	6.3	
	8/4/09	22.78	-	-	-0.30	NM	1.03	-136	NM	NM	6.6	
	8/19/09	22.39	-	-	0.09	NM	0.70	-119	NM	NM	6.5	
	9/9/09	22.09	-	-	0.39	NM	1.01	-116	NM	NM	7.0	
	9/16/09	22.14	-	-	0.34	17.60	0.21	-146.4	1.016	452	6.75	
	9/23/09	22.03	-	-	0.45	NM	1.14	-112	NM	NM	6.6	
	10/7/09	22.75	-	-	-0.27	NM	1.07	-128	NM	NM	6.6	
	10/22/09	23.06	-	-	-0.58	NM	1.39	-109	NM	NM	6.6	
	11/18/09	22.98	-	-	-0.50	NM	1.45	-95	NM	NM	6.6	
	11/25/09	22.84	-	-	-0.36	NM	NM	NM	NM	NM	NM	
	12/2/09	22.90	-	-	-0.42	NM	1.05	-89	NM	NM	6.50	
	12/10/09	21.29	-	-	1.19	17.11	1.12	-96.5	0.909	515	6.76	
	12/16/09	22.94	-	-	-0.46	NM	1.00	-91.0	NM	NM	6.7	
	12/30/09	22.79	-	-	-0.31	NM	5.56	-79.0	NM	NM	6.7	
	1/14/10	22.78	-	-	-0.30	NM	1.32	-133	NM	NM	6.7	
	1/28/10	22.67	-	-	-0.19	NM	0.97	-131	NM	NM	6.7	
	3/4/10	22.60	-	-	-0.12	NM	2.02	-130	NM	NM	6.8	
	3/17/10	22.40	-	-	0.08	18.07	0.14	-134.7	1.039	406	6.9	
	3/25/10	22.33	-	-	0.15	NM	1.41	-122	NM	NM	7.0	
	4/15/10	22.19	-	-	0.29	NM	1.81	-117	NM	NM	6.8	
	4/29/10	22.30	-	-	0.18	NM	2.05	-134	NM	NM	6.9	
	5/20/10	22.47	-	-	0.01	NM	2.42	-130	NM	NM	7.2	
	6/1/10	22.49	-	-	-0.01	27.23	0.29	-159.3	1.068	304	7.0	
	6/3/10	22.52	-	-	-0.04	NM	2.25	-89	NM	NM	6.8	
	6/17/10	22.50	-	-	-0.02	NM	1.70	-100	NM	NM	6.9	
	7/13/10	22.59	-	-	-0.11	NM	1.21	-122	NM	NM	6.8	
	7/29/10	22.50	-	-	-0.02	NM	2.72	-58	NM	NM	7.5	
	8/12/10	22.57	-	-	-0.09	NM	2.29	-49	NM	NM	8.1	
	8/26/10	22.59	-	-	-0.11	NM	3.04	-46	NM	NM	8.0	
	9/9/10	22.61	-	-	-0.13	NM	9.40	24	NM	NM	8.9	
	9/23/10	22.88	-	-	-0.40	NM	2.39	-50	NM	NM	7.2	
	10/7/10	22.78	-	-	-0.30	NM	4.22	-14	NM	NM	6.7	
	10/28/10	22.83	-	-	-0.35	NM	3.35	-67	NM	NM	6.9	
	11/9/10	22.84	-	-	-0.36	NM	NM	NM	NM	NM	NM	
	11/12/10	22.96	-	-	-0.48	NM	3.70	-69	NM	NM	7.7	
	11/23/10	22.82	-	-	-0.34	NM	6.48	-65	NM	NM	7.3	
	12/16/10	23.13	-	-	-0.65	NM	4.58	-17	NM	NM	7.7	
	12/30/10	23.29	-	-	-0.81	NM	4.02	-8	NM	NM	7.5	
	1/14/11	23.31	-	-	-0.83	NM	3.81	-43	NM	NM	7.0	
	2/10/11	23.26	-	-	-0.78	NM	3.18	-73	NM	NM	7.1	
	3/9/11	23.15	-	-	-0.67	NM	3.96	-95	NM	NM	7.4	
	3/14/11	22.98	-	-	-0.50	17.58	3.29	-55.1	0.82	NM	6.9	
	4/21/11	22.79	-	-	-0.31	NM	9.08	-49.5	NM	NM	7.3	
	5/16/11	22.58	-	-	-0.10	17.40	7.14	-80.1	0.255	NM	7.4	
	5/19/11	22.56	-	-	-0.08	NM	4.71	-69	NM	NM	6.7	
	6/16/11	22.73	-	-	-0.25	NM	4.72	-42	NM	NM	6.4	
	7/21/11	22.89	-	-	-0.41	NM	3.10	-9.9	NM	NM	5.8	
	8/17/11	22.94	-	-	-0.46	NM	1.81	-5	NM	NM	6.7	
	9/22/11	21.82	-	-	0.66	NM	2.53	-15	NM	NM	7.9	
	10/27/11	21.74	-	-	0.74	NM	NM	NM	NM	NM	NM	
	11/28/11	22.17	-	-	0.31	NM	4.02	70	NM	NM	7.7	
	12/21/11	21.87	-	-	0.61	17.93	2.08	54	0.35	NM	6.9	
	1/26/12	22.07	-	-	0.41	NM	1.48	-162	NM	NM	6.7	
	2/29/12	22.58	-	-	-0.10	NM	3.85	55.1	NM	NM	6.7	
	3/16/12	22.51	-	-	-0.03	NM	5.14	-40.4	NM	NM	7.6	
	4/6/12	22.79	-	-	-0.31	NM	3.60	22.8	NM	NM	7.1	
	5/15/12	22.84	-	-	-0.36	NM	4.81	-34.7	NM	NM	6.92	
	6/14/12	22.96	-	-	-0.48	NM	0.90	-25.0	NM	NM	6.35	
	6/18/12	22.96	-	-	-0.48	18.27	4.26	-130.0	NM	NM	6.76	
	7/16/12	23.30	-	-	-0.82	NM	2.20	-88.9	NM	NM	6.36	
	8/8/12	23.20	-	-	-0.72	NM	5.47	-34.2	NM	NM	6.45	
	9/11/12	23.12	-	-	-0.64	NM	7.93	-11.8	NM	NM	7.03	
	11/27/12	23.19	-	-	-0.71	NM	8.71	-38.6	NM	NM	6.91	
	12/31/12	23.38	-	-	-0.90	NM	15.04	50.4	NM	NM	8.01	
S-52	3/25/09	23.54	23.90	-	-	-0.36	NM	0.18	-94.3	NM	NM	NM
	5/7/09	23.52	-	-	0.02	NM	NM	NM	504	NM		
	6/22/09	23.12	-	-	0.42	NM	0.33	-116.2	0.873	336	6.62	
	9/16/09	22.76	-	-	0.78	15.96	0.33	-131.5	0.880	460	6.81	
	12/10/09	22.45	-	-	1.09	14.61	0.25	-135.9	0.878	312	6.89	
	3/17/10	22.38	-	-	1.16	15.15	0.65	-133.8	0.894	356	6.9	
	6/1/10	22.41	-	-	1.13	22.2	6.57	-84.6	0.977	294	7.07	
	3/14/11	23.49	-	-	0.05	NM	NM	NM	NM	NM	NM	
	5/16/11	22.91	-	-	0.63	15.18	3.66	-7.50	0.450	NM	6.79	
	12/21/11	22.27	-	-	1.27	NM	NM	NM	NM	NM	NM	
	6/18/12	23.30	-	-	0.24	NM	NM	NM	NM	NM	NM	

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-117	3/25/09	18.41	18.12	-	-	0.29	NM	0.25	-229.9	NM	NM	NM
	5/7/09	17.58	-	-	-	0.83	NM	NM	-98.3	0.521	9,999	NM
	6/23/09	17.34	-	-	-	1.07	NM	0.25	-101.2	0.236	288	6.33
	9/16/09	16.88	-	-	-	1.53	17.75	0.50	-101.2	0.215	319	6.57
	12/10/09	16.29	-	-	-	2.12	13.48	0.28	-97.5	0.215	2,064	6.78
	3/17/10	16.87	-	-	-	1.54	16.87	0.23	-112.6	0.552	3,783	6.53
	6/1/10	16.52	-	-	-	1.89	18.97	1.70	-92.2	1.087	293	6.76
	3/14/11	17.84	-	-	-	0.57	NM	NM	NM	NM	NM	NM
	5/16/11	17.20	-	-	-	1.21	15.54	3.80	-11.30	0.355	NM	6.38
	12/21/11	16.66	-	-	-	1.75	NM	NM	NM	NM	NM	NM
	6/18/12	17.54	-	-	-	0.87	NM	NM	NM	NM	NM	NM
S-210	3/23/09	23.69	24.49	-	-	-0.80	NM	0.47	-48.8	NM	NM	7.17
	4/1/09	NM	-	-	-	NM	NM	1.57	-88.0	NM	NM	NM
	4/15/09	NM	-	-	-	NM	NM	4.02	-53.0	NM	NM	NM
	4/22/09	NM	-	-	-	NM	NM	2.04	-64.0	NM	NM	NM
	5/7/09	24.08	-	-	-	-0.39	NM	0.90	-46.00	NM	NM	NM
	5/21/09	NM	-	-	-	NM	NM	0.83	NM	NM	NM	NM
	6/4/09	NM	-	-	-	NM	NM	0.58	-72.00	NM	NM	NM
	6/23/09	23.71	-	-	-	-0.02	NM	1.16	-82.0	NM	NM	NM
	7/8/09	23.69	-	-	-	0.00	NM	0.95	-118.0	NM	NM	6.3
	7/21/09	23.79	-	-	-	-0.10	NM	1.86	-89.0	NM	NM	6.1
	8/4/09	23.82	23.79	0.03	-	-0.11	NM	NM	NM	NM	NM	NM
	8/19/09	23.65	23.62	0.03	-	0.06	NM	NM	NM	NM	NM	NM
	9/9/09	23.30	23.29	0.01	-	0.40	NM	NM	NM	NM	NM	NM
	9/16/09	23.38	-	-	-	0.31	NM	NM	NM	NM	NM	NM
	9/23/09	23.29	23.20	0.09	-	0.47	NM	NM	NM	NM	NM	NM
	10/7/09	23.88	23.79	0.09	-	-0.12	NM	NM	NM	NM	NM	NM
	10/22/09	24.36	24.24	0.12	-	-0.58	NM	NM	NM	NM	NM	NM
	11/25/09	24.07	-	-	-	-0.38	NM	NM	NM	NM	NM	NM
	12/2/09	24.11	-	-	-	-0.42	NM	1.54	-92	NM	NM	6.5
	12/10/09	23.48	-	-	-	0.21	NM	NM	NM	NM	370	NM
	12/16/09	24.11	-	-	-	-0.42	NM	1.63	-88	NM	NM	6.6
	12/30/09	23.97	-	-	-	-0.28	NM	1.04	-76	NM	NM	6.6
	1/14/10	23.90	-	-	-	-0.21	NM	1.55	-94	NM	NM	6.5
	1/28/10	23.80	-	-	-	-0.11	NM	0.73	-119	NM	NM	6.7
	3/4/10	23.78	-	-	-	-0.09	NM	1.55	-110	NM	NM	6.7
	3/17/10	23.60	-	-	-	0.09	NM	NM	NM	NM	NM	NM
	3/25/10	23.49	-	-	-	0.20	NM	1.78	-86	NM	NM	6.6
	4/15/10	23.38	-	-	-	0.31	NM	1.81	-111	NM	NM	6.7
	4/29/10	23.49	-	-	-	0.20	NM	2.19	-109	NM	NM	6.8
	5/20/10	23.65	-	-	-	0.04	NM	2.34	-116	NM	NM	6.9
	6/1/10	23.68	-	-	-	0.01	NM	NM	NM	NM	289	NM
	6/3/10	23.68	-	-	-	0.01	NM	1.14	-106	NM	NM	6.8
	6/17/10	23.71	-	-	-	-0.02	NM	1.89	-101	NM	NM	6.8
	7/13/10	24.27	23.58	0.69	-	-0.06	NM	NM	NM	NM	NM	NM
	7/29/10	24.25	23.42	0.83	-	0.06	NM	NM	NM	NM	NM	NM
	8/12/10	24.39	23.50	0.89	-	-0.03	NM	NM	NM	NM	NM	NM
	8/26/10	24.34	23.61	0.73	-	-0.10	NM	NM	NM	NM	NM	NM
	9/9/10	24.39	23.59	0.80	-	-0.10	NM	NM	NM	NM	NM	NM
	9/23/10	24.74	23.80	0.94	-	-0.34	NM	NM	NM	NM	NM	NM
	10/7/10	24.58	23.70	0.88	-	-0.23	NM	NM	NM	NM	NM	NM
	10/28/10	24.75	23.69	1.06	-	-0.27	NM	NM	NM	NM	NM	NM
	11/9/10	24.75	23.72	1.03	-	-0.29	NM	NM	NM	NM	NM	NM
	11/12/10	24.76	23.85	0.91	-	-0.39	NM	NM	NM	NM	NM	NM
	11/23/10	24.70	23.68	1.02	-	-0.24	NM	NM	NM	NM	NM	NM
	12/16/10	24.85	24.10	0.75	-	-0.60	NM	NM	NM	NM	NM	NM
	12/30/10	23.16	22.30	0.86	-	1.18	NM	NM	NM	NM	NM	NM
	1/14/11	24.71	24.40	0.31	-	-0.79	NM	NM	NM	NM	NM	NM
	2/10/11	22.74	22.41	0.33	-	1.20	NM	NM	NM	NM	NM	NM
	3/9/11	24.38	24.35	0.03	-	-0.67	NM	NM	NM	NM	NM	NM
	3/14/11	24.20	-	-	-	-0.51	17.09	4.40	-30	0.66	NM	6.7
	4/21/11	24.09	24.00	0.09	-	-0.33	NM	NM	NM	NM	NM	NM
	5/16/11	23.81	23.76	0.05	-	-0.08	NM	NM	NM	NM	NM	NM
	5/19/11	23.82	23.75	0.07	-	-0.08	NM	NM	NM	NM	NM	NM
	6/16/11	24.04	23.87	0.17	-	-0.22	NM	NM	NM	NM	NM	NM
	7/21/11	24.21	24.02	0.19	-	-0.38	NM	NM	NM	NM	NM	NM
	8/17/11	24.15	24.11	0.04	-	-0.43	NM	NM	NM	NM	NM	NM
	9/22/11	23.05	22.99	0.06	-	0.69	NM	NM	NM	NM	NM	NM
	10/27/11	22.93	22.90	0.03	-	0.78	NM	NM	NM	NM	NM	NM
	11/28/11	23.42	23.39	0.03	-	0.29	NM	NM	NM	NM	NM	NM
	12/21/11	23.13	23.07	0.06	-	0.61	NM	NM	NM	NM	NM	NM
	1/26/12	23.35	23.31	0.04	-	0.37	NM	NM	NM	NM	NM	NM
	2/29/12	23.86	23.54	0.32	-	0.07	NM	NM	NM	NM	NM	NM
	3/16/12	23.94	23.64	0.30	-	-0.02	NM	NM	NM	NM	NM	NM
	4/6/12	24.22	23.92	0.30	-	-0.31	NM	NM	NM	NM	NM	NM
	5/15/12	24.10	24.08	0.02	-	-0.39	NM	NM	NM	NM	NM	NM
	6/14/12	24.29	24.25	0.04	-	-0.57	NM	NM	NM	NM	NM	NM
	6/18/12	24.24	24.20	0.04	-	-0.52	NM	NM	NM	NM	NM	NM
	7/16/12	24.60	24.40	0.20	-	-0.76	NM	10.79	-31.80	NM	NM	6.19
	8/8/12	24.60	24.40	0.20	-	-0.76	NM	12.01	85.30	NM	NM	6.18
	9/11/12	24.46	24.41	0.05	-	-0.73	NM	NM	NM	NM	NM	NM
	11/27/12	24.45	24.40	0.05	-	-0.72	NM	NM	NM	NM	NM	NM
	12/31/12	24.65	24.60	0.05	-	-0.92	NM	NM	NM	NM	NM	NM

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-226	3/23/09	22.02	22.51	-	-	-0.49	NM	0.25	-70.9	NM	NM	NM
	4/1/09	NM	-	-	-	NM	NM	7.00	-20	NM	NM	NM
	4/15/09	NM	-	-	-	NM	NM	5.28	-26	NM	NM	NM
	4/22/09	NM	-	-	-	NM	NM	0.88	-56	NM	NM	NM
	5/7/09	22.20	-	-	-	-0.18	NM	0.32	-73	NM	2,883	6.5
	5/21/09	NM	-	-	-	NM	NM	1.80	NM	NM	NM	NM
	6/4/09	NM	-	-	-	NM	NM	1.06	-14	NM	NM	NM
	6/23/09	21.85	-	-	-	0.17	NM	0.22	-99.3	0.670	282	6.63
	7/8/09	21.80	-	-	-	0.22	NM	4.34	22	NM	NM	5.7
	7/21/09	21.86	-	-	-	0.16	NM	2.13	-16	NM	NM	5.7
	8/4/09	21.82	-	-	-	0.20	NM	4.12	-36.0	NM	NM	6.4
	8/19/09	21.73	-	-	-	0.29	NM	0.48	-125	NM	NM	6.6
	9/9/09	21.49	-	-	-	0.53	NM	3.63	120	NM	NM	5.7
	9/16/09	21.43	-	-	-	0.59	16.43	0.25	-97.2	0.663	321	6.69
	9/23/09	21.35	-	-	-	0.67	NM	2.25	-44	NM	NM	6.3
	10/7/09	21.95	-	-	-	0.07	NM	2.47	-35	NM	NM	6.3
	10/22/09	22.22	-	-	-	-0.20	NM	1.80	-58	NM	NM	6.4
	11/18/09	22.11	-	-	-	-0.09	NM	1.27	-86	NM	NM	6.5
	11/25/09	22.04	-	-	-	-0.02	NM	NM	NM	NM	NM	NM
	12/2/09	22.14	-	-	-	-0.12	NM	1.78	-42	NM	NM	6.2
	12/10/09	21.67	-	-	-	0.35	14.91	0.27	-117.9	0.75	573	6.76
	12/16/09	22.12	-	-	-	-0.10	NM	2.37	21	NM	NM	6.2
	12/30/09	21.96	-	-	-	0.06	NM	1.84	-20	NM	NM	6.3
	1/14/10	21.90	-	-	-	0.12	NM	1.6	-18	NM	NM	6.1
	1/28/10	21.84	-	-	-	0.18	NM	1.71	-47	NM	NM	6.3
	3/4/10	21.77	-	-	-	0.25	NM	2.28	-59	NM	NM	6.5
	3/17/10	22.63	-	-	-	-0.61	16.19	0.14	-112	0.76	432	6.8
	3/25/10	21.51	-	-	-	0.51	NM	1.94	-74	NM	NM	6.5
	4/15/10	21.35	-	-	-	0.67	NM	2.62	-82	NM	NM	6.6
	4/29/10	21.51	-	-	-	0.51	NM	2.91	-83	NM	NM	6.9
	5/20/10	21.60	-	-	-	0.42	NM	2.20	-115	NM	NM	7.1
	6/1/10	22.04	18.45	*3.59	-	2.67	NM	NM	NM	NM	284	NM
	6/3/10	22.09	21.52	0.57	-	0.36	NM	NM	NM	NM	NM	NM
	6/17/10	22.22	21.54	0.68	-	0.31	NM	NM	NM	NM	NM	NM
	7/13/10	22.31	21.65	0.66	-	0.21	NM	NM	NM	NM	NM	NM
	7/29/10	22.00	21.59	0.41	-	0.33	NM	NM	NM	NM	NM	NM
	8/12/10	21.33	21.30	0.03	-	0.71	NM	NM	NM	NM	NM	NM
	8/26/10	21.86	-	-	-	0.16	NM	16.88	-30	NM	NM	7.8
	9/9/10	21.85	21.81	0.04	-	0.20	NM	NM	NM	NM	NM	NM
	9/23/10	22.31	22.02	0.29	-	-0.07	NM	NM	NM	NM	NM	NM
	10/7/10	22.05	21.95	0.10	-	0.04	NM	NM	NM	NM	NM	NM
	10/28/10	22.25	21.96	0.29	-	-0.01	NM	NM	NM	NM	NM	NM
	11/9/10	22.38	22.00	0.38	-	-0.08	NM	NM	NM	NM	NM	NM
	11/12/10	22.78	21.97	0.81	-	-0.15	NM	NM	NM	NM	NM	NM
	11/23/10	22.56	21.88	0.68	-	-0.03	NM	NM	NM	NM	NM	NM
	12/16/10	22.92	22.11	0.81	-	-0.29	NM	NM	NM	NM	NM	NM
	12/30/10	24.83	24.35	0.48	-	-2.45	NM	NM	NM	NM	NM	NM
	1/14/11	23.16	22.41	0.75	-	-0.58	NM	NM	NM	NM	NM	NM
	2/10/11	24.49	24.40	0.09	-	-2.40	NM	NM	NM	NM	NM	NM
	3/9/11	22.68	22.41	0.27	-	-0.46	NM	NM	NM	NM	NM	NM
	3/14/11	22.23	-	-	-	-0.21	15.96	6.15	84.1	0.567	NM	7.2
	4/21/11	22.10	22.05	0.05	-	-0.04	NM	NM	NM	NM	NM	NM
	5/16/11	21.80	-	-	-	0.22	15.57	4.74	-14.1	0.389	NM	6.72
	5/19/11	21.85	-	-	-	0.17	NM	2.51	-37	NM	NM	6.3
	6/16/11	21.95	-	-	-	0.07	NM	3.02	-34	NM	NM	6.3
	7/21/11	23.84	-	-	-	-1.82	NM	2.26	32.1	NM	NM	6.0
	8/17/11	22.19	-	-	-	-0.17	NM	2.88	9.0	NM	NM	6.2
	9/22/11	21.08	-	-	-	0.94	NM	2.24	35.0	NM	NM	6.2
	10/27/11	20.96	-	-	-	1.06	NM	NM	NM	NM	NM	NM
	11/28/11	21.44	-	-	-	0.58	NM	2.57	83.00	NM	NM	6.99
	12/21/11	21.23	-	-	-	0.79	17.31	9.77	73.7	0.25	NM	6.4
	1/26/12	22.64	22.32	0.32	-	-0.38	NM	NM	NM	NM	NM	NM
	2/29/12	21.99	21.60	0.39	-	-0.32	NM	NM	NM	NM	NM	NM
	3/16/12	22.11	21.70	0.41	-	-0.22	NM	NM	NM	NM	NM	NM
	4/6/12	22.25	21.97	0.28	-	-0.02	NM	NM	NM	NM	NM	NM
	5/15/12	22.29	22.11	0.18	-	-0.14	NM	NM	NM	NM	NM	NM
	6/14/12	22.29	22.28	0.01	-	-0.26	NM	NM	NM	NM	NM	NM
	6/18/12	22.23	22.21	0.02	-	-0.20	NM	NM	NM	NM	NM	NM
	7/16/12	22.50	22.00	0.50	-	-0.11	NM	6.60	142.10	NM	NM	5.72
	8/8/12	23.00	22.55	0.45	-	-0.64	NM	1.76	-52.30	NM	NM	6.64
	9/11/12	22.62	22.34	0.28	-	-0.39	NM	NM	NM	NM	NM	NM
	11/27/12	22.49	22.41	0.08	-	-0.41	NM	NM	NM	NM	NM	NM
	12/31/12	22.65	22.60	0.05	-	-0.59	NM	NM	NM	NM	NM	NM

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-230	9/14/07	20.19	-	-	-	-0.44	19.5	0.87	-113.00	NM	770	7.0
	3/25/09	20.63	-	-	-	NM	NM	0.26	-105.9	NM	NM	NM
	4/1/09	NM	-	-	-	NM	NM	1.58	-84	NM	NM	NM
	4/15/09	NM	-	-	-	NM	NM	1.52	-69	NM	NM	NM
	4/22/09	NM	-	-	-	NM	NM	1.78	-58	NM	NM	NM
	5/7/09	18.70	-	-	-	1.49	NM	1.04	-79	NM	NM	NM
	5/21/09	NM	-	-	-	NM	NM	1.21	NM	NM	NM	NM
	6/4/09	NM	-	-	-	NM	NM	0.68	-71	NM	NM	NM
	6/23/09	18.65	-	-	-	1.54	NM	0.64	-105	NM	NM	NM
	7/8/09	19.62	-	-	-	0.57	NM	0.56	-126	NM	NM	6.4
	7/21/09	19.78	-	-	-	0.41	NM	0.78	-51	NM	NM	5.9
	8/4/09	19.29	-	-	-	0.90	NM	0.98	-111	NM	NM	6.7
	8/19/09	19.65	-	-	-	0.54	NM	0.33	-142	NM	NM	6.9
	9/9/09	19.32	-	-	-	0.87	NM	0.59	-125	NM	NM	6.7
	9/16/09	18.81	-	-	-	1.38	NM	NM	NM	NM	NM	NM
	9/23/09	19.09	-	-	-	1.10	NM	0.70	-106	NM	NM	6.7
	10/7/09	20.36	-	-	-	-0.17	NM	0.92	-96	NM	NM	6.6
	10/22/09	20.39	-	-	-	-0.20	NM	1.30	-97	NM	NM	6.7
	11/25/09	19.29	-	-	-	0.90	NM	NM	NM	NM	NM	NM
	12/2/09	20.92	-	-	-	-0.73	NM	2.07	-57	NM	NM	6.7
	12/10/09	20.91	-	-	-	-0.72	NM	NM	NM	NM	319	NM
	12/16/09	19.31	-	-	-	0.88	NM	5.00	0.6	NM	NM	7.0
	12/30/09	18.89	-	-	-	1.30	NM	1.51	-32	NM	NM	6.9
	1/14/10	20.27	-	-	-	-0.08	NM	2.62	-20	NM	NM	6.5
	1/28/10	18.95	-	-	-	1.24	NM	3.55	-5	NM	NM	7.3
	3/4/10	18.33	-	-	-	1.86	NM	3.03	-94	NM	NM	7.3
	3/17/10	16.57	-	-	-	3.62	NM	NM	NM	NM	NM	NM
	3/25/10	17.75	-	-	-	2.44	NM	3.74	16	NM	NM	6.9
	4/15/10	19.02	-	-	-	1.17	NM	3.06	-99	NM	NM	7.1
	4/29/10	17.97	-	-	-	2.22	NM	3.78	-66	NM	NM	7.2
	5/20/10	17.97	-	-	-	2.22	NM	3.37	-67	NM	NM	7.7
	6/1/10	20.07	-	-	-	0.12	NM	NM	NM	NM	296	NM
	6/3/10	20.33	-	-	-	-0.14	NM	4.33	29	NM	NM	6.8
	6/17/10	19.69	-	-	-	0.50	NM	3.36	-38	NM	NM	7.3
	7/13/10	10.00	-	-	-	20.19	NM	5.45	27	NM	NM	6.8
	7/29/10	18.95	-	-	-	1.24	NM	2.35	-80	NM	NM	9.0
	8/12/10	20.20	-	-	-	-0.01	NM	2.37	-44	NM	NM	7.2
	8/26/10	22.59	-	-	-	-2.40	NM	3.04	-46	NM	NM	8.0
	9/9/10	22.61	-	-	-	-2.42	NM	9.40	24	NM	NM	8.9
	9/23/10	22.88	-	-	-	-2.69	NM	2.39	-50	NM	NM	7.2
	10/7/10	19.14	-	-	-	1.05	NM	4.05	3	NM	NM	6.7
	10/28/10	20.09	-	-	-	0.10	NM	3.58	-2	NM	NM	7.3
	11/9/10	19.60	-	-	-	0.59	NM	NM	NM	NM	NM	NM
	11/12/10	20.61	-	-	-	-0.42	NM	3.52	26	NM	NM	6.9
	11/23/10	20.30	-	-	-	-0.11	NM	3.65	-63	NM	NM	7.2
	12/16/10	19.86	-	-	-	0.33	NM	4.47	11	NM	NM	6.6
	12/30/10	20.76	-	-	-	-0.57	NM	4.78	35	NM	NM	7.3
	1/14/11	20.92	-	-	-	-0.73	NM	3.67	35	NM	NM	6.7
	2/10/11	17.66	-	-	-	2.53	NM	6.13	6	NM	NM	6.9
	3/9/11	17.69	-	-	-	2.50	NM	4.39	-31	NM	NM	7.2
	3/14/11	17.55	-	-	-	2.64	16.08	1.33	-26	0.807	NM	6.6
	4/21/11	17.60	-	-	-	2.59	NM	4.94	-3.8	NM	NM	8.2
	5/16/11	19.33	-	-	-	0.86	15.34	3.87	-20.7	0.422	NM	6.9
	5/19/11	17.15	-	-	-	3.04	NM	4.18	60.0	NM	NM	5.6
	6/16/11	19.95	-	-	-	0.24	NM	3.47	-8.0	NM	NM	6.4
	7/21/11	20.38	-	-	-	-0.19	NM	1.88	5.2	NM	NM	5.8
	8/17/11	17.97	-	-	-	2.22	NM	1.19	-5	NM	NM	6.7
	9/22/11	18.63	-	-	-	1.56	NM	1.31	23	NM	NM	6.3
	10/27/11	18.18	-	-	-	2.01	NM	NM	NM	NM	NM	NM
	11/28/11	18.25	-	-	-	1.94	NM	1.33	74.00	NM	NM	6.8
	12/21/11	18.67	-	-	-	1.52	18.23	4.04	30.6	0.23	NM	7.5
	1/26/12	17.40	-	-	-	2.79	NM	1.63	-110.1	NM	NM	6.9
	2/29/12	19.49	-	-	-	0.70	NM	6.63	63.0	NM	NM	6.5
	3/16/12	20.16	-	-	-	0.03	NM	5.66	-8.9	NM	NM	7.1
	4/6/12	20.48	-	-	-	-0.29	NM	6.75	19.5	NM	NM	7.4
	5/15/12	21.02	-	-	-	-0.83	NM	6.08	-42.0	NM	NM	7.05
	6/14/12	19.69	-	-	-	0.50	NM	0.98	-44.9	NM	NM	6.64
	6/18/12	20.27	-	-	-	-0.08	20.05	1.99	-84.8	NM	NM	6.69
	7/16/12	20.80	-	-	-	-0.61	NM	15.18	51.3	NM	NM	6.90
	8/8/12	20.70	-	-	-	-0.51	NM	2.34	-51.40	NM	NM	7.07
	9/11/12	20.80	-	-	-	-0.61	NM	17.13	48.70	NM	NM	6.81
	11/27/12	19.70	-	-	-	0.49	NM	8.57	-21.60	NM	NM	6.91
	12/31/12	20.35	-	-	-	-0.16	NM	10.97	31.80	NM	NM	7.04

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-231	9/14/07	19.94	-	-	-	-0.90	20.30	0.65	-90.00	NM	2,958	6.8
	3/25/09		20.84	-	-	NM	NM	0.30	-106.5	NM	NM	NM
	4/1/09		NM	-	-	NM	NM	1.22	-82	NM	NM	NM
	4/15/09		NM	-	-	NM	NM	1.40	-41	NM	NM	NM
	4/22/09		NM	-	-	NM	NM	3.45	2.0	NM	NM	NM
	5/7/09		19.89	-	-	0.05	NM	0.32	-23	NM	4,935	3.1
	5/21/09		NM	-	-	NM	NM	2.12	NM	NM	NM	NM
	6/4/09		NM	-	-	NM	NM	1.01	-75	NM	NM	NM
	6/22/09		19.22	-	-	0.72	NM	0.35	-99.5	1,410	301	6.51
	7/8/09		20.04	-	-	-0.10	NM	0.51	-104	NM	NM	6.2
	7/21/09		20.19	-	-	-0.25	NM	0.75	-72	NM	NM	5.9
	8/4/09		20.15	-	-	-0.21	NM	1.08	-82	NM	NM	6.4
	8/19/09		20.02	-	-	-0.08	NM	0.91	-100	NM	NM	6.5
	9/9/09		19.76	-	-	0.18	NM	1.20	-78	NM	NM	6.4
	9/16/09		19.66	-	-	0.28	19.70	0.42	-94.9	0.870	3,636	6.53
	9/23/09		19.62	-	-	0.32	NM	0.84	-39	NM	NM	6.2
	10/7/09		20.12	-	-	-0.18	NM	1.40	-58	NM	NM	6.2
	10/22/09		20.47	-	-	-0.53	NM	0.66	-41	NM	NM	6.1
	11/25/09		20.28	-	-	-0.34	NM	NM	NM	NM	NM	NM
	12/2/09		20.40	-	-	-0.46	NM	1.11	-82	NM	NM	6.4
	12/10/09		20.04	-	-	-0.10	17.16	0.83	-100.3	1,289	2,181	6.46
	12/16/09		20.55	-	-	-0.61	NM	2.66	-33	NM	NM	6.2
	12/30/09		20.18	-	-	-0.24	NM	1.10	-69	NM	NM	6.4
	1/14/10		20.11	-	-	-0.17	NM	1.81	-68	NM	NM	6.1
	1/28/10		20.04	-	-	-0.10	NM	1.71	-69	NM	NM	6.4
	3/4/10		20.02	-	-	-0.08	NM	2.01	-66	NM	NM	6.5
	3/17/10		19.84	-	-	0.10	20.31	0.10	-140	1,689	660	6.7
	3/25/10		19.85	-	-	0.09	NM	2.24	-72	NM	NM	6.7
	4/15/10		19.60	-	-	0.34	NM	1.20	-72	NM	NM	6.3
	4/29/10		19.76	-	-	0.18	NM	1.68	-36	NM	NM	6.5
	5/20/10		19.91	-	-	0.03	NM	1.63	-67	NM	NM	6.6
	6/1/10		19.93	-	-	0.01	21.73	0.18	-111.4	1,616	427	6.7
	6/3/10		19.94	-	-	0.00	NM	1.81	-20	NM	NM	6.4
	6/17/10		20.04	-	-	-0.10	NM	1.97	-30	NM	NM	6.4
	7/13/10		19.87	-	-	0.07	NM	0.98	-68	NM	NM	6.1
	7/29/10		19.81	-	-	0.13	NM	3.27	28	NM	NM	6.9
	8/12/10		19.95	-	-	-0.01	NM	1.71	-29	NM	NM	6.9
	8/26/10		20.17	-	-	-0.23	NM	2.54	-18	NM	NM	7.1
	9/9/10		20.17	-	-	-0.23	NM	3.50	-36	NM	NM	7.6
	9/23/10		20.46	-	-	-0.52	NM	4.93	15	NM	NM	7.4
	10/7/10		20.33	-	-	-0.39	NM	2.87	4	NM	NM	6.6
	10/28/10		20.38	-	-	-0.44	NM	3.07	2	NM	NM	6.5
	11/9/10		20.42	-	-	-0.48	NM	NM	NM	NM	NM	NM
	11/12/10		20.55	-	-	-0.61	NM	4.15	46	NM	NM	6.1
	11/23/10		20.38	-	-	-0.44	NM	2.39	-50	NM	NM	7.2
	12/16/10		21.08	21.07	0.01	-1.13	NM	NM	NM	NM	NM	NM
	12/30/10		20.81	20.80	0.01	-0.86	NM	NM	NM	NM	NM	NM
	1/14/11		21.11	20.82	0.29	-0.95	NM	NM	NM	NM	NM	NM
	2/10/11		20.79	20.24	0.55	-0.44	NM	NM	NM	NM	NM	NM
	3/9/11		20.73	20.25	0.48	-0.43	NM	NM	NM	NM	NM	NM
	3/14/11		20.13	-	-	-0.19	18.01	1.89	-27	2.56	NM	6.5
	4/21/11		20.46	20.01	0.45	-0.18	NM	NM	NM	NM	NM	NM
	5/16/11		19.98	19.92	0.06	0.00	NM	NM	NM	NM	NM	NM
	5/19/11		20.40	20.02	0.38	-0.17	NM	NM	NM	NM	NM	NM
	6/16/11		20.49	20.12	0.37	-0.27	NM	NM	NM	NM	NM	NM
	7/21/11		20.61	20.29	0.32	-0.43	NM	NM	NM	NM	NM	NM
	8/17/11		20.65	20.44	0.21	-0.55	NM	NM	NM	NM	NM	NM
	9/22/11		19.36	19.21	0.15	0.69	NM	NM	NM	NM	NM	NM
	10/27/11		-	-	-	-	NM	NM	NM	NM	NM	NM
	11/28/11		19.91	19.73	0.18	0.17	NM	NM	NM	NM	NM	NM
	12/21/11		19.60	19.46	0.14	0.45	NM	NM	NM	NM	NM	NM
	1/26/12		19.66	19.52	0.14	0.39	NM	NM	NM	NM	NM	NM
	2/29/12		20.01	19.89	0.12	0.02	NM	NM	NM	NM	NM	NM
	3/16/12		19.83	19.76	0.07	0.16	NM	NM	NM	NM	NM	NM
	6/18/12		20.60	20.49	0.11	-0.58	NS	NS	NS	NS	NS	NS
	7/16/12		21.40	20.70	0.70	-0.93	NM	26.00	-70.3	NM	NM	6.61
	8/8/12		21.20	20.90	0.30	-1.04	NM	NM	NM	NM	NM	NM
	9/11/12		21.20	20.50	0.70	-0.73	NM	NM	NM	NM	NM	NM
	11/27/12		20.74	20.66	0.08	-0.74	NM	NM	NM	NM	NM	NM
	12/31/12		20.90	20.88	0.02	-0.94	NM	NM	NM	NM	NM	NM

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-232	9/14/07	20.31	-	-	-	NM	NM	NM	NM	NM	NM	NM
	3/25/09	21.55	-	-	-1.24	NM	0.20	-110.1	NM	NM	NM	NM
	4/1/09	NM	-	-	NM	NM	27.30	23	NM	NM	NM	NM
	4/15/09	NM	-	-	NM	NM	26.11	28	NM	NM	NM	NM
	4/22/09	NM	-	-	NM	NM	13.85	147	NM	NM	NM	NM
	5/7/09	20.69	-	-	-0.38	NM	11.09	284	NM	563	3.0	
	5/21/09	NM	-	-	NM	NM	9.12	NM	NM	NM	NM	NM
	6/4/09	NM	-	-	NM	NM	19.90	43	NM	NM	NM	NM
	6/22/09	20.46	-	-	-0.15	NM	6.25	31.5	1.781	271	6.38	
	7/8/09	21.01	-	-	-0.70	NM	31.02	3	NM	NM	6.8	
	7/21/09	21.02	-	-	-0.71	NM	30.97	0.2	NM	NM	6.4	
	8/4/09	20.80	-	-	-0.49	NM	22.51	-15	NM	NM	6.5	
	8/19/09	20.89	-	-	-0.58	NM	21.02	29	NM	NM	6.6	
	9/9/09	20.34	-	-	-0.03	NM	12.15	-12	NM	NM	6.5	
	9/16/09	19.55	-	-	0.76	19.41	0.61	1.3	1.710	723	6.55	
	9/23/09	20.23	-	-	0.08	NM	17.10	0.0	NM	NM	6.6	
	10/7/09	20.59	-	-	-0.28	NM	22.80	-20.0	NM	NM	6.6	
	10/22/09	20.58	-	-	-0.27	NM	13.96	-24.0	NM	NM	6.5	
	11/25/09	20.67	-	-	-0.36	NM	NM	NM	NM	NM	NM	
	12/2/09	20.99	-	-	-0.68	NM	28.17	-41	NM	NM	6.9	
	12/10/09	20.07	-	-	0.24	18.35	26.58	56.70	1.667	369	6.80	
	12/16/09	20.87	-	-	-0.56	NM	29.42	5	NM	NM	6.8	
	12/30/09	20.72	-	-	-0.41	NM	23.33	-35	NM	NM	6.7	
	1/14/10	24.84	-	-	-4.53	NM	22.85	95	NM	NM	6.4	
	1/28/10	20.61	-	-	-0.30	NM	29.63	14	NM	NM	6.9	
	3/4/10	20.60	-	-	-0.29	NM	22.91	9	NM	NM	6.8	
	3/17/10	20.22	-	-	0.09	20.54	1.65	34	1.92	2,397	6.6	
	3/25/10	20.25	-	-	0.06	NM	2.49	22	NM	NM	6.7	
	4/15/10	20.11	-	-	0.20	NM	2.81	-4	NM	NM	6.7	
	4/29/10	20.25	-	-	0.06	NM	1.84	-29	NM	NM	6.7	
	5/20/10	20.48	-	-	-0.17	NM	2.84	-20	NM	NM	6.9	
	6/1/10	19.44	-	-	0.87	22.22	0.66	-37.8	2.116	368	6.8	
	6/3/10	20.51	-	-	-0.20	NM	3.05	-22	NM	NM	6.6	
	6/17/10	20.71	-	-	-0.40	NM	10.29	30	NM	NM	6.8	
	7/13/10	19.40	-	-	0.91	NM	1.31	-86	NM	NM	6.5	
	7/29/10	19.45	-	-	0.86	NM	4.01	23	NM	NM	6.9	
	8/12/10	19.65	-	-	0.66	NM	1.99	-38	NM	NM	7.5	
	8/26/10	19.82	-	-	0.49	NM	2.18	20	NM	NM	6.9	
	9/9/10	20.18	-	-	0.13	NM	6.35	-23	NM	NM	7.7	
	9/23/10	21.10	-	-	-0.79	NM	2.97	35	NM	NM	6.7	
	10/7/10	20.97	-	-	-0.66	NM	2.35	35	NM	NM	6.3	
	10/28/10	21.00	-	-	-0.69	NM	18.36	16	NM	NM	6.5	
	11/9/10	21.18	-	-	-0.87	NM	NM	NM	NM	NM	NM	
	11/12/10	21.31	-	-	-1.00	NM	12.22	36	NM	NM	6.3	
	11/23/10	21.04	-	-	-0.73	NM	9.05	-17	NM	NM	6.5	
	12/16/10	21.47	-	-	-1.16	NM	5.46	61	NM	NM	6.3	
	12/30/10	21.60	-	-	-1.29	NM	3.97	69	NM	NM	6.7	
	1/14/11	21.65	-	-	-1.34	NM	3.24	7	NM	NM	6.5	
	2/10/11	21.18	-	-	-0.87	NM	4.56	35	NM	NM	6.7	
	3/9/11	21.01	-	-	-0.70	NM	3.64	15	NM	NM	6.6	
	3/14/11	20.75	-	-	-0.44	19.11	1.39	-43	1.07	NM	6.8	
	4/21/11	20.64	-	-	-0.33	NM	5.83	13	NM	NM	6.9	
	5/16/11	20.89	-	-	-0.58	19.03	3.32	-5	0.53	NM	6.7	
	5/19/11	20.94	-	-	-0.63	NM	2.28	-20	NM	NM	6.4	
	6/16/11	21.04	-	-	-0.73	NM	2.09	-20	NM	NM	6.7	
	7/21/11	21.17	-	-	-0.86	NM	1.65	4.9	NM	NM	5.8	
	8/17/11	21.27	-	-	-0.96	NM	1.34	45	NM	NM	5.3	
	9/22/11	20.12	-	-	0.19	NM	0.94	26.0	NM	NM	5.9	
	10/27/11	-	-	-	-	NM	NM	NM	NM	NM	NM	
	11/28/11	20.28	-	-	1.74	NM	2.79	64.00	NM	NM	6.29	
	12/21/11	19.79	-	-	2.23	20.57	4.15	8.1	0.37	NM	7.7	
	1/26/12	20.00	-	-	2.02	NM	1.58	-163.4	0.37	NM	6.7	
	2/29/12	19.61	19.58	0.03	0.72	NM	NM	NM	NM	NM	NM	
	3/16/12	20.16	-	-	0.15	NM	3.77	-3.9	NM	NM	7.0	
	4/6/12	20.91	-	-	-0.60	NM	3.14	12.8	NM	NM	7.30	
	5/15/12	20.03	-	-	0.28	NM	6.42	-49.8	NM	NM	7.25	
	6/14/12	21.31	-	-	-1.00	NM	0.81	-18.3	NM	NM	6.64	
	6/18/12	21.34	-	-	-1.03	21.31	1.76	-90.8	NM	NM	6.8	
	7/16/12	21.70	21.60	0.10	-1.32	NM	1.17	-102.1	NM	NM	6.53	
	8/8/12	21.50	-	-	-1.19	NM	1.54	-58.3	NM	NM	6.47	
	9/11/12	22.10	-	-	-1.79	NM	1.28	-101.3	NM	NM	7.01	
	11/27/12	20.82	-	-	-0.51	NM	7.08	6.7	NM	NM	6.61	
	12/31/12	21.09	-	-	-0.78	NM	11.10	9.5	NM	NM	6.84	

DTW = depth to water (measured from top of inner casing); DTP = depth to product if present (measured from top of inner casing)
Total Depth = Depth to bottom of well (measured from top of inner casing)

Some measurements collected on a monthly basis as part of performance monitoring and some on a quarterly basis as part of quarterly sampling program.

Note: If Readings from O&M and GW sampling occurred on same day (or within a day), the GW Sampling reading was tabulated.

Note that DO during GW sampling is consistently lower than 'grab' samples done during O&M.

System shut down on 11-13-09 due to paving activities; restarted on 11-18-09. (switched injection to shallow points except deep injection at IP-17, 18 & 19).

Could not read 17th Street points on 11/25/09 due to continued paving in roadway. During February visits could not check wells due to amount of snow.

† - depth to water was 0.0 (at surface) most likely due to surface run off entering well.

*Measurement assumed to be erroneously high - well re-gauged two days later and confirmed with bailer to be closer to second reading.

TABLE 3a

SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM DO FIELD DATA
SHALLOW WELLS ONLY

DATE	IW-1S	IW-2S	IW-3S	IW-4S	IW-5S	IW-6S	IW-7S	IW-8S	IW-9S	IW-10S	IW-11S	IW-12S	IW-13S	IW-14S	IW-15S	IW-16S	IW-17S	IW-18S	IW-19S	IW-20S	IW-21S	IW-22S	IW-23S	IW-24S	IW-25S	IW-26S	IW-27S	
25-Mar-09	4.36	3.89	3.16	2.79	1.86	1.82	1.31	1.79	1.87	1.92	1.14	1.47	1.79	1.05	0.22	1.33	0.25	0.23	0.22	2.13	0.16	0.18	0.26	0.43	1.53	0.22	0.29	
8-Apr-09	7.20	16.01	3.83	14.01	3.13	13.06	5.27	7.28	20.70	22.72	9.54	25.11	3.36	29.35	4.05	29.26	21.86	38.92	26.06	34.60	5.20	23.00	12.31	3.31	22.87	28.10	2.74	
15-Apr-09	4.92	27.80	NM-I	25.37	4.98	25.11	4.09	22.85	33.58	5.38	3.31	32.20	3.50	33.33	3.36	NM	NM											
22-Apr-09	NM	NM	NM	NM	NM	30.51	33.04	30.53	33.55	22.48	25.58	47.03	53.05	4.02	49.87	32.17	3.85											
06-May-09	35.15	NM	3.21	NM	3.05	NM	2.15	NM	39.31	NM	13.28	NM	5.30	NM	3.23	NM	36.66	NM	37.73	NM	10.44	NM	37.92	NM	39.58	NM	3.97	
21-May-09	NM	5.72	NM	28.50	NM	35.16	NM	36.28	NM	16.52	NM	36.96	NM	39.07	NM	37.80	NM	36.44	NM	37.20	NM	38.44	NM	4.55	NM	36.11	NM	
04-Jun-09	31.45	NM	3.10	NM	2.28	NM	2.17	NM	37.82	NM	1.82	NM	15.82	NM	2.45	NM	26.71	NM	33.80	NM	15.64	NM	27.38	NM	27.27	NM	2.61	
23-Jun-09	NM	17.66	NM	19.85	NM	15.39	NM	17.36	NM	7.01	NM	24.88	NM	26.16	NM	26.26	NM	26.85	NM	15.84	NM	29.20	NM	2.66	NM	20.35	NM	
08-Jul-09	34.40	NM	2.29	NM	2.68	NM	3.56	NM	32.86	NM	3.19	NM	36.09	NM	2.78	NM	33.70	NM	32.20	NM	18.92	NM	36.01	NM	34.93	NM	32.52	
21-Jul-09	NM	17.40	NM	34.70	NM	34.84	NM	30.71	NM	17.53	NM	36.34	NM	33.27	NM	31.70	NM	31.08	NM	31.78	NM	35.03	NM	3.30	NM	31.88	NM	
04-Aug-09	6.00	NM	35.25	NM	2.65	NM	3.98	NM	34.53	NM	2.55	NM	34.88	NM	2.19	NM	30.75	NM	30.18	NM	3.79	NM	34.71	NM	32.41	NM	31.32	
19-Aug-09	NM	15.09	NM	37.85	NM	42.38	NM	25.54	NM	19.52	NM	14.10	NM	10.79	NM	19.51	NM	18.37	NM	31.71	NM	32.96	NM	14.95	NM	36.20	NM	
09-Sep-09	35.96	NM	2.91	NM	3.29	NM	6.62	NM	33.46	NM	2.75	NM	34.35	NM	4.70	NM	25.81	NM	28.01	NM	25.20	NM	34.04	NM	15.45	NM	27.52	
23-Sep-09	NM	19.22	NM	33.26	NM	34.42	NM	32.01	NM	20.61	NM	35.33	NM	33.13	NM	35.51	NM	31.82	NM	34.40	NM	29.11	NM	NM	NM	36.01	NM	
7-Oct-09	36.22	NM	2.45	NM	3.99	NM	9.16	NM	30.88	NM	2.88	NM	32.76	NM	2.74	NM	31.10	NM	27.40	NM	28.48	NM	29.63	NM	38.48	NM	36.66	
21-Oct-09	NM	25.01	NM	35.52	NM	32.69	NM	31.98	NM	22.04	NM	30.39	NM	32.23	NM	31.87	NM	30.65	NM	28.18	NM	33.27	NM	4.11	NM	34.18	NM	
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	26.08	27.40	25.77	24.55	30.33	30.04											
2-Dec-09	29.94	NM	35.28	NM	34.80	NM	26.95	NM	33.11	NM	17.10	NM	25.85	NM	31.51	NM	33.16	NM	31.08	NM	25.86	NM	30.80	NM	19.71	NM	17.56	
16-Dec-09	NM	35.58	NM	20.27	NM	27.61	NM	23.17	NM	29.90	NM	6.36	NM	34.37	NM	33.99	NM	36.55	NM	32.80	NM	29.80	NM	30.90	NM	31.49	NM	
30-Dec-09	36.39	NM	36.95	NM	35.10	NM	28.08	NM	28.21	NM	7.43	NM	26.76	NM	29.37	NM	30.42	NM	33.96	NM	27.63	NM	34.00	NM	10.13	NM	35.23	
14-Jan-10	NM	30.84	NM	33.33	NM	25.93	NM	22.00	NM	28.87	NM	24.38	NM	27.80	NM	25.96	NM	28.52	NM	26.19	NM	22.70	NM	22.94	NM	18.27	NM	
28-Jan-10	36.39	NM	36.14	NM	31.92	NM	24.88	NM	28.86	NM	3.85	NM	25.56	NM	30.07	NM	32.33	NM	30.57	NM	24.21	NM	33.58	NM	32.97	NM	32.73	
4-Mar-10	36.87	NM	42.25	NM	39.58	NM	20.84	NM	31.50	NM	5.46	NM	26.06	NM	30.77	NM	33.16	NM	32.19	NM	19.38	NM	33.53	NM	37.81	NM	34.69	
25-Mar-10	NM	29.48	NM	25.73	NM	28.75	NM	25.08	NM	32.64	NM	7.05	NM	32.62	NM	31.78	NM	33.23	NM	31.38	NM	21.14	NM	27.63	NM	33.64	NM	
15-Apr-10	34.83	NM	35.04	NM	36.13	NM	18.88	NM	28.83	NM	5.18	NM	25.65	NM	29.42	NM	32.08	NM	29.33	NM	22.57	NM	34.50	NM	32.86	NM	30.30	
29-Apr-10	NM	31.49	NM	31.25	NM	37.24	NM	28.91	NM	35.93	NM	5.14	NM	33.98	NM	30.06	NM	32.64	NM	29.36	NM	29.08	NM	29.91	NM	33.95	NM	
20-May-10	30.70	NM	34.42	NM	35.40	NM	14.41	NM	27.67	NM	5.85	NM	24.98	NM	24.56	NM	34.76	NM	32.28	NM	26.19	NM	30.64	NM	34.11	NM	28.66	
3-Jun-10	NM	30.24	NM	32.34	NM	35.26	NM	27.27	NM	32.38	NM	4.24	NM	8.91	NM	26.94	NM	32.44	NM	27.60	NM	23.73	NM	28.09	NM	32.71	NM	
17-Jun-10	32.86	NM	34.43	NM	34.96	NM	39.16	NM	28.41	NM	6.73	NM	21.67	NM	29.58	NM	33.56	NM	29.69	NM	28.41	NM	29.78	NM	34.66	NM	28.44	
13-Jul-10	NM	NM	NM	NM	NM	NM	28.11	NM	19.43	NM	3.96	NM	8.25	NM	28.49	NM	30.13	NM	29.57	NM	24.55	NM	28.38	NM	25.25	NM		
29-Jul-10	27.13	NM	32.84	NM	34.59	NM	36.90	NM	27.28	NM	7.02	NM	23.35	NM	23.89	NM	26.63	NM	30.07	NM	25.61	NM	21.98	NM	24.25	NM	25.70	
12-Aug-10	NM	29.81	NM	27.62	NM	30.84	NM	32.39	NM	32.48	NM	4.35	NM	31.49	NM	31.31	NM	31.62	NM	26.60	NM	22.08	NM	23.65	NM	20.46	NM	
26-Aug-10	32.11	NM	37.68	NM	37.92	NM	40.22	NM	29.07	NM	4.02	NM	28.73	NM	23.33	NM	24.16	NM	20.31	NM	20.63	NM	16.91	NM	18.95	NM	20.82	
9-Sep-10	NM	36.10	NM	28.43	NM	26.73	NM	22.66	NM	34.42	NM	8.19	NM	28.32	NM	22.79	NM	26.59	NM	24.54	NM	19.44	NM	16.85	NM	11.29	NM	
23-Sep-10	21.15	NM	28.37	NM	28.21	NM	31.11	NM	21.85	NM	4.72	NM	20.80	NM	19.55	NM	21.98	NM	19.62	NM	20.04	NM	16.80	NM	19.67	NM	21.61	
7-Oct-10	NM	31.74	NM	31.60	NM	36.70	NM	31.37	NM	34.21	NM	4.50	NM	32.21	NM	28.65	NM	27.95	NM	23.55	NM	20.60	NM	23.51	NM	16.26	NM	
28-Oct-10	31.91	NM	29.01	NM	30.40	NM	21.32	NM	24.95	NM	4.33	NM	26.84	NM	28.23	NM	26.91	NM	22.82	NM	26.47	NM	25.08	NM	19.62	NM	31.61	
12-Nov-10	NM	29.06	NM	26.95	NM	31.73	NM	29.83	NM	31.90	NM	3.85	NM	32.09	NM	26.18	NM	28.36	NM	37.40	NM	30.55	NM	31.76	NM	25.25	NM	
23-Nov-10	33.46	NM	32.95	NM	31.61	NM	38.81	NM	25.43	NM	4.87	NM	27.66	NM	28.99	NM	29.21	NM	27.28	NM	30.33	NM	25.63	NM	16.51	NM	33.54	
16-Dec-10	NM	27.84	NM	NM	NM	34.61	NM	28.33	NM	31.44	NM	5.20	NM	29.74	NM	29.54	NM	36.94	NM	27.65	NM	25.72	NM	29.82	NM	19.48	NM	
30-Dec-10	30.01	NM	35.12	NM	30.70	NM	36.21	NM	24.16	NM	4.71	NM	27.56	NM	29.48	NM	29.33	NM	25.97	NM	29.61	NM	25.58	NM	18.80	NM	31.98	
14-Jan-11	NM	27.15	NM	26.98	NM	33.11	NM	27.77	NM	34.83	NM	4.66	NM	31.53	NM	29.43	NM	28.32	NM	26.54	NM	27.82	NM	29.70	NM	20.61	NM	
10-Feb-11	33.77	NM	37.58	NM	36.33	NM	39.11	NM	30.61	NM	5.51	NM	31.86	NM	31.28	NM	27.28	NM	29.04	NM	31.41	NM	30.20	NM	31.48	NM	32.78	
9-Mar-11	NM	26.76	NM	28.58	NM	32.98	NM	31.98	NM	31.78	NM	5.19	NM	30.46	NM	27.02	NM	29.03	NM	28.49	NM	26.17	NM	26.87	NM	26.18	NM	
21-Apr-11	44.03	NM	46.31	NM	46.42	NM	50.36	NM	36.11	NM	12.35	NM	40.62	NM	48.52	NM	42.56	NM	39.52	NM	40.21	NM	39.32	NM	37.02	NM	45.66	
19-May-11	NM	40.31	NM	37.33	NM	49.97	NM	47.41	NM	45.31	NM																	

TABLE 3b

SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM DO FIELD DATA
DEEP WELLS ONLY



DATE	IW-1D	IW-2D	IW-3D	IW-4D	IW-5D	IW-6D	IW-7D	IW-8D	IW-9D	IW-10D	IW-11D	IW-12D	IW-13D	IW-14D	IW-15D	IW-16D	IW-17D	IW-18D	IW-19D	IW-20D	IW-21D	IW-22D	IW-23D	IW-24D	IW-25D	IW-26D	IW-27D
25-Mar-09	7.04	2.13	2.28	2.77	1.93	2.07	0.38	1.89	1.45	2.01	1.66	1.6	1.68	2.31	0.25	1.44	0.99	0.22	1.43	1.94	1.51	0.2	0.25	1.72	NM	0.2	1.37
08-Apr-09	12.56	13.02	14.23	2.77	13.94	13.65	15.48	26.26	18.66	31.27	29.02	18.20	12.48	18.94	35.51	30.10	14.98	19.89	19.90	15.50	20.20	6.88	22.91	16.08	30.94	10.57	14.87
15-Apr-09	15.52	30.24	NM-I	2.79	35.98	33.70	33.62	30.46	32.95	37.01	32.73	32.65	13.01	34.17	36.50	NM											
22-Apr-09	NM	NM	NM	NM	NM	30.70	13.76	15.55	28.10	19.52	41.07	12.10	54.80	48.13	47.11	13.65	49.40										
06-May-09	12.73	NM	27.80	NM	37.48	NM	33.88	NM	37.94	NM	41.28	NM	17.77	NM	38.12	NM	21.37	NM	34.62	NM	31.42	NM	34.88	NM	42.54	NM	34.15
21-May-09	NM	39.77	NM	3.23	NM	40.11	NM	37.81	NM	39.50	NM	36.11	NM	34.80	NM	27.56	NM	27.47	NM	26.32	NM	26.77	NM	39.30	NM	13.33	NM
04-Jun-09	5.40	NM	33.77	NM	32.94	NM	31.78	NM	31.01	NM	37.32	NM	28.55	NM	29.82	NM	16.85	NM	29.60	NM	28.65	NM	26.73	NM	30.75	NM	26.23
23-Jun-09	NM	25.50	NM	2.84	NM	21.25	NM	25.66	NM	26.51	NM	21.54	NM	19.74	NM	29.71	NM	13.85	NM	11.86	NM	16.91	NM	22.56	NM	16.25	NM
08-Jul-09	12.74	NM	39.12	NM	33.94	NM	36.58	NM	34.91	NM	41.18	NM	34.88	NM	37.54	NM	32.78	NM	34.12	NM	30.98	NM	32.68	NM	39.62	NM	34.55
21-Jul-09	NM	37.54	NM	4.29	NM	40.77	NM	36.37	NM	42.90	NM	37.60	NM	35.80	NM	38.77	NM	27.27	NM	31.50	NM	33.10	NM	36.91	NM	32.55	NM
04-Aug-09	34.08	NM	1.64	NM	39.06	NM	34.53	NM	37.98	NM	41.07	NM	31.55	NM	33.21	NM	24.30	NM	36.36	NM	33.34	NM	30.80	NM	42.22	NM	37.15
19-Aug-09	NM	40.53	NM	2.50	NM	42.12	NM	40.80	NM	44.36	NM	17.30	NM	6.49	NM	10.20	NM	19.24	NM	41.83	NM	26.00	NM	46.01	NM	18.29	NM
09-Sep-09	5.30	NM	38.38	NM	33.68	NM	35.64	NM	33.32	NM	35.77	NM	31.87	NM	35.35	NM	29.70	NM	31.75	NM	33.11	NM	33.26	NM	38.00	NM	33.80
23-Sep-09	NM	37.40	NM	2.90	NM	33.92	NM	34.57	NM	35.58	NM	34.34	NM	33.50	NM	33.96	NM	31.67	NM	27.31	NM	26.61	NM	38.13	NM	23.25	NM
7-Oct-09	5.25	NM	38.12	NM	39.72	NM	36.71	NM	36.82	NM	34.62	NM	33.44	NM	35.01	NM	30.03	NM	33.61	NM	30.66	NM	28.75	NM	38.06	NM	36.42
21-Oct-09	NM	36.16	NM	2.96	NM	35.50	NM	35.63	NM	35.89	NM	36.17	NM	35.23	NM	32.60	NM	30.18	NM	30.66	NM	17.38	NM	37.22	NM	18.17	NM
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM										
2-Dec-09	29.75	NM	29.51	NM	25.88	NM	37.00	NM	29.18	NM	30.96	NM	27.51	NM	31.03	NM	31.11	NM	32.72	NM	24.02	NM	24.01	NM	33.56	NM	30.58
16-Dec-09	NM	21.56	NM	41.41	NM	22.92	NM	24.44	NM	37.15	NM	19.29	NM	21.75	NM	16.73	NM	36.29	NM	19.50	NM	7.00	NM	31.72	NM	7.85	NM
30-Dec-09	16.78	NM	26.99	NM	22.91	NM	36.31	NM	23.07	NM	26.77	NM	22.11	NM	28.73	NM	33.70	NM	36.53	NM	15.08	NM	20.71	NM	25.54	NM	28.33
14-Jan-10	NM	11.81	NM	24.54	NM	22.02	NM	16.77	NM	23.15	NM	9.80	NM	10.20	NM	5.84	NM	29.29	NM	10.17	NM	5.57	NM	24.46	NM	3.91	NM
28-Jan-10	12.31	NM	17.66	NM	18.66	NM	35.30	NM	20.81	NM	22.44	NM	17.63	NM	24.58	NM	30.62	NM	34.90	NM	7.77	NM	7.02	NM	38.37	NM	24.51
4-Mar-10	11.12	NM	12.69	NM	5.28	NM	36.15	NM	16.77	NM	17.95	NM	11.72	NM	22.46	NM	35.95	NM	36.74	NM	8.74	NM	5.64	NM	44.14	NM	18.40
25-Mar-10	NM	9.12	NM	21.28	NM	15.05	NM	18.55	NM	20.46	NM	6.70	NM	12.31	NM	4.21	NM	31.51	NM	9.06	NM	10.21	NM	21.45	NM	11.44	NM
15-Apr-10	12.66	NM	11.91	NM	7.73	NM	34.11	NM	13.66	NM	16.07	NM	8.84	NM	17.38	NM	28.24	NM	32.42	NM	5.52	NM	5.84	NM	38.12	NM	15.17
29-Apr-10	NM	5.86	NM	15.39	NM	14.48	NM	16.40	NM	19.59	NM	3.66	NM	8.44	NM	3.47	NM	31.69	NM	11.08	NM	5.70	NM	19.96	NM	9.36	NM
20-May-10	7.53	NM	8.88	NM	5.03	NM	34.40	NM	16.12	NM	12.58	NM	6.37	NM	13.55	NM	32.97	NM	29.75	NM	4.27	NM	7.03	NM	39.17	NM	10.69
3-Jun-10	NM	7.25	NM	10.32	NM	12.25	NM	15.34	NM	18.05	NM	3.97	NM	30.29	NM	3.25	NM	30.08	NM	8.05	NM	5.58	NM	15.31	NM	4.93	NM
17-Jun-10	7.77	NM	6.53	NM	6.28	NM	26.71	NM	14.02	NM	10.05	NM	3.52	NM	11.63	NM	30.33	NM	35.01	NM	3.70	NM	6.02	NM	38.61	NM	6.67
13-Jul-10	NM	NM	NM	NM	NM	NM	7.43	NM	11.15	NM	4.92	NM	32.57	NM	2.71	NM	28.65	NM	2.38	NM	4.08	NM	12.80	NM	3.55	NM	
29-Jul-10	6.21	NM	5.92	NM	8.83	NM	23.21	NM	12.47	NM	7.64	NM	4.70	NM	9.85	NM	26.52	NM	31.92	NM	4.83	NM	4.86	NM	29.60	NM	5.48
12-Aug-10	NM	8.16	NM	9.86	NM	9.64	NM	9.26	NM	8.01	NM	5.12	NM	7.83	NM	3.42	NM	29.81	NM	4.43	NM	4.36	NM	13.15	NM	5.36	NM
26-Aug-10	8.17	NM	5.21	NM	5.06	NM	9.86	NM	8.93	NM	4.15	NM	3.78	NM	8.84	NM	22.85	NM	22.14	NM	3.85	NM	4.47	NM	22.39	NM	4.31
9-Sep-10	NM	15.64	NM	8.08	NM	11.81	NM	12.18	NM	7.11	NM	10.29	NM	10.85	NM	14.38	NM	20.32	NM	8.54	NM	7.62	NM	10.39	NM	7.92	NM
23-Sep-10	8.03	NM	5.55	NM	6.44	NM	7.46	NM	4.56	NM	3.77	NM	3.32	NM	7.66	NM	21.36	NM	20.44	NM	4.38	NM	3.62	NM	22.39	NM	5.34
7-Oct-10	NM	5.16	NM	5.46	NM	8.24	NM	8.32	NM	5.74	NM	4.02	NM	6.54	NM	4.33	NM	26.53	NM	3.47	NM	5.27	NM	3.53	NM	7.87	NM
28-Oct-10	6.83	NM	4.32	NM	5.84	NM	5.14	NM	5.92	NM	3.57	NM	3.41	NM	4.43	NM	26.71	NM	28.12	NM	3.69	NM	6.74	NM	37.76	NM	3.96
12-Nov-10	NM	3.98	NM	4.72	NM	5.83	NM	7.68	NM	8.49	NM	4.46	NM	7.62	NM	12.58	NM	28.63	NM	4.86	NM	7.37	NM	5.66	NM	5.23	NM
23-Nov-10	6.78	NM	5.29	NM	5.04	NM	5.83	NM	6.54	NM	4.68	NM	4.20	NM	4.44	NM	26.95	NM	30.80	NM	4.58	NM	5.42	NM	38.44	NM	4.19
16-Dec-10	NM	6.69	NM	NM	NM	6.29	NM	9.72	NM	5.10	NM	4.86	NM	5.11	NM	4.32	NM	29.71	NM	5.42	NM	6.84	NM	5.32	NM	5.81	NM
30-Dec-10	8.64	NM	5.85	NM	5.93	NM	5.03	NM	4.84	NM	6.08	NM	4.66	NM	31.77	NM	31.76	NM	3.75	NM	6.53	NM	40.62	NM	4.40		
14-Jan-11	NM	5.51	NM	5.22	NM	5.88	NM	8.20	NM	5.83	NM	6.33	NM	7.06	NM	4.31	NM	29.86	NM	5.35	NM	5.34	NM	5.58	NM	5.88	NM
10-Feb-11	5.69	NM	5.43	NM	5.85	NM	6.82	NM	5.93	NM	4.63	NM	6.89	NM	4.89	NM	27.31	NM	31.31	NM	5.88	NM	7.56	NM	43.77	NM	6.17
9-Mar-11	NM	6.48	NM	5.71	NM	5.39	NM	9.62	NM	5.63	NM	5.85	NM	14.95	NM	4.26	NM	30.20	NM	4.86	NM	5.84	NM	5.58	NM	5.33	NM
21-Apr-11	6.47	NM	5.83	NM	6.31	NM	9.82	NM	10.58	NM	8.15	NM	7.49	NM	7.67	NM	45.14	NM	41.17	NM	6.12	NM	8.62	NM	49.77	NM	11.24
19-May-11	NM	6.44	NM	7.39	NM	8.73	NM	15.43	NM	7.14	NM	7.47	NM	30.02	NM	6.81	NM	43.59	NM	8.72	NM	7.03	NM	7.89	NM	7.19	NM
16-Jun-11	9.88	NM	6.07	NM	6.41	NM	5.56	NM	8.77																		

TABLE 4a

SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM ORP FIELD DATA
SHALLOW WELLS ONLY

DATE	IW-1S	IW-2S	IW-3S	IW-4S	IW-5S	IW-6S	IW-7S	IW-8S	IW-9S	IW-10S	IW-11S	IW-12S	IW-13S	IW-14S	IW-15S	IW-16S	IW-17S	IW-18S	IW-19S	IW-20S	IW-21S	IW-22S	IW-23S	IW-24S	IW-25S	IW-26S	IW-27S	
25-Mar-09	16	-183	-126	-262	-102	-11	-47	-71	-27	-74	-20	-193	-135	-127	-148	-169	-183	-180	-174	-182	-221	-150	-162	-239	-213	166	-121	
8-Apr-09	-88	-43	141	272	-4	309	205	104	316	206	81	325	1	292	116	297	287	299	294	368	125	257	219	32	240	269	78	
15-Apr-09	-5	-20	NM-I	64	-77	34	-24	51	69	24	-21	56	-1	64	3.36	NM	NM											
22-Apr-09	NM	NM	NM	NM	NM	NM	47	57	45	87	83	112	24	51	-43	32	33	-50										
6-May-09	69	NM	157	NM	-68	NM	17	NM	286	NM	-14	NM	153	NM	-51	NM	270	NM	296	NM	319	NM	312	NM	316	NM	-2	
21-May-09	NM	5.72	NM	NM	NM	NM	NM	NM	37.8	NM	NM																	
4-Jun-09	29	NM	-81	NM	-116	NM	-89	NM	110	NM	-88	NM	96	NM	-86	NM	55	NM	70	NM	23	NM	116	NM	153	NM	-4	
23-Jun-09	NM	-105	NM	123	NM	144	NM	145	NM	165	NM	165	NM	127	NM	36	NM	40	NM	70	NM	115	NM	-114	NM	40	NM	
8-Jul-09	-23	NM	-116	NM	-105	NM	-61	NM	48	NM	-94	NM	35	NM	-74	NM	26	NM	47	NM	30	NM	94	NM	84	NM	99	
22-Jul-09	NM	-120	NM	68	NM	90	NM	84	NM	105	NM	92	NM	21	NM	51	NM	64	NM	53	NM	-3	NM	-89	NM	-5	NM	
4-Aug-09	-150	NM	-41	NM	-114	NM	-101	NM	-17	NM	-100	NM	8	NM	-97	NM	13	NM	-5	NM	-22	NM	-4	NM	28	NM	52	
19-Aug-09	NM	-119	NM	13	NM	51	NM	51	NM	80	NM	54	NM	27	NM	53	NM	46	NM	52	NM	35	NM	-91	NM	9	NM	
9-Sep-09	13	NM	-105	NM	-100	NM	-65	NM	58	NM	-92	NM	27	NM	-79	NM	0	NM	18	NM	58	NM	42	NM	47	NM	75	
23-Sep-09	NM	-94	NM	30	NM	86	NM	113	NM	135	NM	129	NM	30	NM	49	NM	40	NM	8	NM	48	NM	-72	NM	14	NM	
7-Oct-09	-33	NM	-141	NM	-90	NM	-60	NM	23	NM	-75	NM	34	NM	-75	NM	-3	NM	20	NM	28	NM	30	NM	42	NM	78	
21-Oct-09	NM	-98	NM	-66	NM	36	NM	74	NM	103	NM	116	NM	4	NM	25	NM	46	NM	52	NM	3	NM	-70	NM	36	NM	
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	5	52	75	67	-5	61										
2-Dec-09	-6	NM	30	NM	8	NM	40	NM	69	NM	31	NM	52	NM	51	NM	68	NM	77	NM	79	NM	84	NM	92	NM	80	
16-Dec-09	NM	103	NM	108	NM	22	NM	-4	NM	42	NM	42	NM	401	NM	7	NM	11	NM	50	NM	0	NM	24	NM	68	NM	
30-Dec-09	-22	NM	23	NM	42	NM	62	NM	47	NM	-44	NM	46	NM	24	NM	37	NM	47	NM	45	NM	34	NM	46	NM	73	
14-Jan-10	NM	53	NM	107	NM	123	NM	58	NM	82	NM	117	NM	478	NM	139	NM	120	NM	146	NM	55	NM	72	NM	100	NM	
28-Jan-10	39	NM	76	NM	-49	NM	30	NM	52	NM	-36	NM	76	NM	3	NM	37	NM	48	NM	26	NM	36	NM	46	NM	70	
4-Mar-10	5	NM	65	NM	82	NM	-6	NM	47	NM	-22	NM	61	NM	3	NM	36	NM	29	NM	14	NM	17	NM	26	NM	61	
25-Mar-10	NM	-19	NM	37	NM	38	NM	15	NM	-21	NM	8	NM	306	NM	140	NM	120	NM	127	NM	3	NM	13	NM	43	NM	
15-Apr-10	17	NM	68	NM	64	NM	84	NM	2	NM	-35	NM	58	NM	-11	NM	27	NM	43	NM	-20	NM	15	NM	10	NM	30	
29-Apr-10	NM	-8	NM	29	NM	37	NM	-2	NM	18	NM	-8	NM	227	NM	-3	NM	13	NM	28	NM	-12	NM	-1	NM	23	NM	
20-May-10	4	NM	47	NM	58	NM	68	NM	7	NM	-55	NM	24	NM	4	NM	-12	NM	-4	NM	-33	NM	-26	NM	4	NM	42	
3-Jun-10	NM	-14	NM	8	NM	21	NM	21	NM	17	NM	-11	NM	102	NM	-26	NM	-12	NM	8	NM	-24	NM	-26	NM	-22	NM	
17-Jun-10	8	NM	59	NM	60	NM	80	NM	-3	NM	-31	NM	6	NM	-24	NM	5	NM	15	NM	-49	NM	-13	NM	-15	NM	18	
13-Jul-10	NM	NM	NM	NM	NM	NM	74	NM	70	NM	22	NM	98	NM	48	NM	76	NM	62	NM	30	NM	60	NM	35	NM		
29-Jul-10	-80	NM	-28	NM	-21	NM	-4	NM	11	NM	16	NM	28	NM	-2	NM	20	NM	15	NM	9	NM	23	NM	48	NM	35	
12-Aug-10	NM	27	NM	31	NM	39	NM	52	NM	54	NM	37	NM	71	NM	92	NM	85	NM	62	NM	55	NM	57	NM	55	NM	
26-Aug-10	-15	NM	13	NM	13	NM	37	NM	25	NM	25	NM	4	NM	8	NM	26	NM	28	NM	26	NM	31	NM	39	NM	45	
9-Sep-10	NM	-12	NM	3	NM	9	NM	19	NM	34	NM	34	NM	42	NM	24	NM	25	NM	35	NM	38	NM	42	NM	37	NM	
23-Sep-10	-25	NM	-9	NM	-10	NM	15	NM	4	NM	4	NM	5	NM	16	NM	30	NM	24	NM	23	NM	29	NM	39	NM	31	
7-Oct-10	NM	7	NM	14	NM	10	NM	11	NM	14	NM	0	NM	23	NM	32	NM	37	NM	20	NM	14	NM	19	NM	21	NM	
28-Oct-10	-3	NM	11	NM	12	NM	28	NM	21	NM	9	NM	13	NM	19	NM	32	NM	34	NM	31	NM	38	NM	48	NM	36	
12-Nov-10	NM	11	NM	30	NM	32	NM	21	NM	31	NM	18	NM	60	NM	38	NM	34	NM	43	NM	37	NM	43	NM	44	NM	
16-Dec-10	NM	2	NM	NM	NM	NM	10	NM	20	NM	20	NM	8	NM	39	NM	58	NM	60	NM	43	NM	40	NM	42	NM	35	
30-Dec-10	15	NM	46	NM	45	NM	54	NM	31	NM	20	NM	44	NM	57	NM	66	NM	66	NM	41	NM	51	NM	63	NM	43	
14-Jan-11	NM	13	NM	28	NM	37	NM	24	NM	28	NM	10	NM	32	NM	28	NM	27	NM	34	NM	34	NM	34	NM	36		
10-Feb-11	-25	NM	-2	NM	15	NM	28	NM	26	NM	7	NM	20	NM	13	NM	31	NM	34	NM	27	NM	1	NM	25	NM	34	
9-Mar-11	NM	-10	NM	15	NM	22	NM	30	NM	36	NM	22	NM	48	NM	24	NM	29	NM	13	NM	5	NM	29	NM	25		
21-Apr-11	19	NM	17	NM	18	NM	23	NM	21	NM	9	NM	23	NM	25	NM	32	NM	24	NM	25	NM	43	NM	40	NM	36	
19-May-11	NM	42	NM	25	NM	24	NM	23	NM	5	NM	-2	NM	4	NM	10	NM	5	NM	-12	NM	15	NM	26	NM	20		
16-Jun-11	8	NM	18	NM	15	NM	21	NM	-9	NM	-1	NM	9	NM	16	NM	21	NM	10	NM	9	NM	24	NM	9	NM	18	
21-Jul-11	NM	14	NM	37	NM	51	NM	24	NM	27	NM	22	NM	9	NM	25	NM	8	NM	28	NM	32	NM	54	NM	40		
17-Aug-11	32	NM	53	NM	56	NM	36	NM	26	NM	23	NM	44	NM	19	NM	27	NM	30	NM	2	NM	56	NM	48	NM	62	
22-Sep-11	NM	26	NM	49	NM	52	NM	43	NM	19	NM	9	NM	30	NM	22	NM	24	NM	9	NM	37	NM	69	NM	72		
28-Nov-11	34	NM	34	NM	32	NM	33	NM	22	NM	21	NM	23	NM	18	NM	18	NM	21	NM	18	NM	35	NM	36	NM	34	
26-Jan-12	NM	184	NM	50	NM	92	NM	24	NM	85	NM	10	NM	29	NM	26	NM	26	NM	-2	NM	-11	NM	67	NM	-45		
29-Feb-12	26	NM	62	NM	66	NM	81	NM	54	NM	46	NM	40	NM	39	NM	38	NM	38	NM	54	NM	44	NM	48	NM	42	
16-Mar-12	NM	-18	NM	-14	NM	-14	NM	-15	NM	-6	NM	-6	NM	-1	NM	-3	NM	-8	NM	4	NM	29	NM	21	NM	24	NM	
6-Apr-12	13	NM	2	NM	5	NM	17	NM	14	NM	34	NM	26	NM	24	NM	18	NM	15	NM	22	NM	35	NM	24	NM	23	
15-May-12	NM	-73	NM	-42	NM	-55	NM	-48	NM	-52	NM	-66	NM	-39	NM	21	NM	-74	NM	-9	NM	-13						

TABLE 4b

SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM ORP FIELD DATA
DEEP WELLS ONLY



DATE	IW-1D	IW-2D	IW-3D	IW-4D	IW-5D	IW-6D	IW-7D	IW-8D	IW-9D	IW-10D	IW-11D	IW-12D	IW-13D	IW-14D	IW-15D	IW-16D	IW-17D	IW-18D	IW-19D	IW-20D	IW-21D	IW-22D	IW-23D	IW-24D	IW-25D	IW-26D	IW-27D	
25-Mar-09	-43	-91	-105	-218	-153	-75	-8	-83	-53	-145	-27	-148	-160	-124	-126	-172	-186	-179	-170	-231	-144	-151	-164	-203	-182	-144	-33	
8-Apr-09	-58	139	167	24	292	262	353	320	325	323	311	288	292	290	352	317	201	245	282	211	334	162	280	268	304.8	255	322	
15-Apr-09	5	21	NM-I	29	66	-3	11	40	55	48	8	41	51	40	26	NM												
22-Apr-09	NM	NM	NM	NM	NM	NM	42	4	4	53	28	99	-35	46	74	16	-9	45										
6-May-09	29	NM	189	NM	188	NM	290	NM	277	NM	302	NM	284	NM	251	NM	228	NM	307	NM	336	NM	317	NM	276	NM	341	
21-May-09	NM	39.77	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM									
4-Jun-09	-120	NM	109	NM	55	NM	42	NM	100	NM	110	NM	54	NM	80	NM	34	NM	29.6	NM	74	NM	135	NM	138	NM	185	
23-Jun-09	NM	48	NM	43	NM	123	NM	144	NM	152	NM	153	NM	197	NM	179	NM	13	NM	8	NM	76	NM	149	NM	6	NM	
8-Jul-09	-144	NM	56	NM	-2	NM	27	NM	51	NM	56	NM	23	NM	26	NM	24	NM	47	NM	84	NM	112	NM	59	NM	65	
22-Jul-09	NM	18	NM	44	NM	93	NM	87	NM	90	NM	94	NM	89	NM	53	NM	22	NM	23	NM	27	NM	-18	NM	40	NM	
4-Aug-09	-3	NM	-159	NM	-36	NM	11	NM	32	NM	-35	NM	54	NM	-44	NM	34	NM	17	NM	-4	NM	31	NM	23	NM	74	
19-Aug-09	NM	12	NM	-2	NM	41	NM	52	NM	46	NM	56	NM	75	NM	40	NM	28	NM	62	NM	43	NM	-22	NM	-4	NM	
9-Sep-09	-150	NM	48	NM	-41	NM	-5	NM	32	NM	37	NM	3	NM	17	NM	4	NM	3	NM	30	NM	49	NM	43	NM	72	
23-Sep-09	NM	30	NM	9	NM	78	NM	106	NM	113	NM	133	NM	120	NM	45	NM	39	NM	1	NM	43	NM	43	NM	-10	NM	
7-Oct-09	-168	NM	3	NM	-39	NM	-15	NM	8	NM	23	NM	-12	NM	22	NM	-13	NM	-3	NM	34	NM	30	NM	38	NM	60	
21-Oct-09	NM	44	NM	-25	NM	28	NM	76	NM	68	NM	111	NM	107	NM	7	NM	44	NM	27	NM	-12	NM	-31	NM	-10	NM	
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-27	32	47	61	-16	38										
2-Dec-09	-12	NM	39	NM	4	NM	58	NM	76	NM	-9	NM	55	NM	43	NM	75	NM	77	NM	66	NM	94	NM	84	NM	72	
16-Dec-09	NM	110	NM	108	NM	-4	NM	18	NM	28	NM	32	NM	45	NM	-16	NM	-10	NM	32	NM	-41	NM	-4	NM	43	NM	
30-Dec-09	-158	NM	12	NM	7	NM	45	NM	11	NM	42	NM	-26	NM	4	NM	16	NM	27	NM	53	NM	17	NM	31	NM	54	
14-Jan-10	NM	52	NM	96	NM	121	NM	43	NM	57	NM	111	NM	39	NM	167	NM	114	NM	127	NM	-28	NM	34	NM	84	NM	
28-Jan-10	-144	NM	72	NM	56	NM	-6	NM	30	NM	39	NM	-6	NM	-39	NM	4	NM	38	NM	30	NM	20	NM	41	NM	56	
4-Mar-10	-148	NM	54	NM	87	NM	-42	NM	12	NM	35	NM	-13	NM	-35	NM	19	NM	3	NM	25	NM	-11	NM	28	NM	44	
25-Mar-10	NM	-35	NM	-6	NM	23	NM	29	NM	-41	NM	-10	NM	10	NM	152	NM	125	NM	105	NM	-66	NM	-4	NM	27	NM	
15-Apr-10	-138	NM	42	NM	77	NM	76	NM	-52	NM	-6	NM	-23	NM	-43	NM	26	NM	28	NM	-49	NM	-8	NM	15	NM	25	
29-Apr-10	NM	-13	NM	3	NM	17	NM	-16	NM	-3	NM	5	NM	-25	NM	-34	NM	6	NM	-3	NM	-70	NM	-14	NM	8	NM	
20-May-10	-158	NM	17	NM	52	NM	68	NM	-31	NM	6	NM	-59	NM	-14	NM	-20	NM	-20	NM	-59	NM	-65	NM	-15	NM	31	
3-Jun-10	NM	-6	NM	-7	NM	1	NM	20	NM	9	NM	-24	NM	230	NM	-51	NM	-22	NM	-17	NM	-63	NM	-36	NM	-27	NM	
17-Jun-10	-221	NM	39	NM	58	NM	65	NM	-36	NM	-4	NM	-32	NM	-45	NM	-6	NM	-4	NM	-70	NM	-34	NM	-18	NM	7	
40372	NM	23	NM	82	NM	43	NM	430	NM	1	NM	63	NM	18	NM	-69	NM	27	NM	-44	NM							
29-Jul-10	-187	NM	-57	NM	-18	NM	-13	NM	7	NM	12	NM	15	NM	-24	NM	8	NM	-7	NM	8	NM	3	NM	41	NM	42	
12-Aug-10	NM	12	NM	11	NM	8	NM	27	NM	35	NM	38	NM	35	NM	89	NM	82	NM	69	NM	52	NM	56	NM	48	NM	
26-Aug-10	-65	NM	-19	NM	13	NM	19	NM	6	NM	23	NM	-10	NM	-21	NM	16	NM	16	NM	18	NM	7	NM	43	NM	33	
9-Sep-10	NM	7	NM	-10	NM	18	NM	2	NM	23	NM	35	NM	40	NM	8	NM	15	NM	23	NM	37	NM	45	NM	33	NM	
23-Sep-10	-92	NM	-29	NM	-14	NM	-5	NM	-3	NM	2	NM	1	NM	2	NM	22	NM	13	NM	18	NM	13	NM	32	NM	30	
7-Oct-10	NM	-24	NM	-15	NM	11	NM	-10	NM	4	NM	-3	NM	5	NM	15	NM	34	NM	6	NM	2	NM	13	NM	12	NM	
28-Oct-10	-112	NM	-20	NM	-10	NM	-2	NM	4	NM	14	NM	-3	NM	-7	NM	24	NM	24	NM	22	NM	16	NM	50	NM	26	
12-Nov-10	NM	-44	NM	-10	NM	30	NM	-10	NM	13	NM	18	NM	25	NM	25	NM	25	NM	25	NM	-2	NM	33	NM	34	NM	
16-Dec-10	NM	-21	NM	NM	NM	-4	NM	-6	NM	11	NM	8	NM	21	NM	44	NM	47	NM	29	NM	39	NM	37	NM	39	NM	
30-Dec-10	-79	NM	21	NM	45	NM	18	NM	10	NM	28	NM	26	NM	40	NM	61	NM	60	NM	23	NM	49	NM	59	NM	38	
14-Jan-11	NM	-29	NM	7	NM	34	NM	-5	NM	11	NM	19	NM	13	NM	22	NM	19	NM	15	NM	22	NM	23	NM	33	NM	
10-Feb-11	-142	NM	-29	NM	-11	NM	-1	NM	13	NM	17	NM	6	NM	4	NM	23	NM	27	NM	18	NM	20	NM	20	NM	6	
9-Mar-11	NM	-40	NM	-28	NM	4	NM	16	NM	7	NM	26	NM	28	NM	7	NM	22	NM	-11	NM	2	NM	6	NM	13		
21-Apr-11	-5	NM	23	NM	4	NM	-4	NM	7	NM	7	NM	5	NM	20	NM	34	NM	20	NM	5	NM	6	NM	41	NM	27	
19-May-11	NM	46	NM	11	NM	20	NM	18	NM	-10	NM	-2	NM	3	NM	-11	NM	4	NM	-29	NM	10	NM	10	NM	10		
16-Jun-11	-72	NM	-5	NM	2	NM	-3	NM	-63	NM	-6	NM	-6	NM	-2	NM	19	NM	2	NM	-4	NM	-1	NM	31	NM	4	
21-Jul-11	NM	2	NM	20	NM	27	NM	23	NM	-16	NM	21	NM	-9	NM	7.6	NM	13	NM	-16	NM	-13	NM	22	NM	30	NM	
17-Aug-11	-22	NM	25	NM	34	NM	6	NM	20	NM	2	NM	21	NM	-5	NM	22	NM	22	NM	-3	NM	-6	NM	68	NM	38	
22-Sep-11	NM	-9	NM	19	NM	33	NM	34	NM	0	NM	6	NM	24	NM	3	NM	20	NM	-10	NM	3	NM	37	NM	42		
28-Nov-11	18	NM	33	NM	33	NM	32	NM	23	NM	21	NM	20	NM	17	NM	18	NM	22	NM	20	NM	32	NM	34	NM	32	
26-Jan-12	NM	183	NM	-73	NM	121	NM	66	NM	-99	NM	8	NM	22	NM	-107	NM	22	NM	9	NM	-147	NM	35	NM	-83	NM	
29-Feb-12	31	NM	69	NM	118	NM	82	NM	44	NM	40	NM	36	NM	40	NM	41	NM	41	NM	44	NM	44	NM	46	NM	37	
16-Mar-12	NM	-27	NM	-15	NM	-14	NM	-14	NM	-3	NM	-8	NM	-4	NM	-7	NM	-7	NM	-2	NM	31	NM	22	NM	22	NM	
6-Apr-12	-14	NM	5	NM	14	NM	27	NM	15	NM	27	NM	20	NM	26	NM	21	NM	1.9	NM	15	NM	26	NM	25	NM	22	
15-May-12	NM	-87	NM	-66	NM	-60	NM	-63	NM	-63	NM	-56	NM	-42	NM	-59	NM	-48	NM	-36	NM	-28	NM	-40	NM	-21	NM	
14-Jun-12	-																											



ATTACHMENT A

Groundwater Laboratory Analytical Data

ANALYTICAL RESULTS

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

October 30, 2012

Project: PHILADELPHIA REFINERY

Submittal Date: 10/19/2012
Group Number: 1343585
PO Number: PHILADELPHIA
State of Sample Origin: PA

Client Sample Description
S-50_101812 Grab Groundwater
S-230_101812 Grab Groundwater
S-232_101812 Grab Groundwater

Lancaster Labs (LLI) #
6830656
6830657
6830658

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Langan	Attn: Dennis Webster
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Tiffani Doerr
ELECTRONIC COPY TO	LLI	Attn: EDD Group
ELECTRONIC COPY TO	Langan	Attn: Kristen Ward
ELECTRONIC COPY TO	Aquaterra Tech	Attn: Loretta Belfiglio

Analysis Report

Respectfully Submitted,



Amek Carter
Specialist

(717) 556-7252

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Sample Description: S-50_101812 Grab Groundwater
Philadelphia Refinery AOI-1
COC: 316626 S-50

LLI Sample # WW 6830656
LLI Group # 1343585
Account # 10132

Project Name: PHILADELPHIA REFINERY

Collected: 10/18/2012 08:30 by MH

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 10/19/2012 13:55

Reported: 10/30/2012 16:40

S--50

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
	GC/MS Volatiles	SW-846 8260B	ug/l	ug/l	ug/l	
10943	Benzene	71-43-2	6,700	100	50	100
10943	Ethylbenzene	100-41-4	59	10	5	10
10943	Methyl Tertiary Butyl Ether	1634-04-4	14	10	5	10
10943	Toluene	108-88-3	20	10	5	10
10943	Xylene (Total)	1330-20-7	< 10	10	5	10

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/13

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10943	UST BTEX, MTBE in Water	SW-846 8260B	1	Z122982AA	10/24/2012 19:40	Daniel H Heller	10
10943	UST BTEX, MTBE in Water	SW-846 8260B	1	Z122982AA	10/24/2012 20:04	Daniel H Heller	100
01163	GC/MS VOA Water Prep	SW-846 5030B	1	Z122982AA	10/24/2012 19:40	Daniel H Heller	10
01163	GC/MS VOA Water Prep	SW-846 5030B	2	Z122982AA	10/24/2012 20:04	Daniel H Heller	100

*=This limit was used in the evaluation of the final result

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Sample Description: S-230_101812 Grab Groundwater
Philadelphia Refinery AOI-1
COC: 316626 S-230

LLI Sample # WW 6830657
LLI Group # 1343585
Account # 10132

Project Name: PHILADELPHIA REFINERY

Collected: 10/18/2012 08:45 by MH

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 10/19/2012 13:55

Reported: 10/30/2012 16:40

S-230

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
	GC/MS Volatiles	SW-846 8260B	ug/l	ug/l	ug/l	
10943	Benzene	71-43-2	57,000	500	250	500
10943	Ethylbenzene	100-41-4	180	1	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	44	1	0.5	1
10943	Toluene	108-88-3	98	1	0.5	1
10943	Xylene (Total)	1330-20-7	140	1	0.5	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/13

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10943	UST BTEX, MTBE in Water	SW-846 8260B	1	Z122982AA	10/24/2012 20:28	Daniel H Heller	1
10943	UST BTEX, MTBE in Water	SW-846 8260B	1	P123011AA	10/27/2012 16:59	Brett W Kenyon	500
01163	GC/MS VOA Water Prep	SW-846 5030B	1	Z122982AA	10/24/2012 20:28	Daniel H Heller	1
01163	GC/MS VOA Water Prep	SW-846 5030B	2	P123011AA	10/27/2012 16:59	Brett W Kenyon	500

*=This limit was used in the evaluation of the final result

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Sample Description: S-232_101812 Grab Groundwater
Philadelphia Refinery AOI-1
COC: 316626 S-232

LLI Sample # WW 6830658
LLI Group # 1343585
Account # 10132

Project Name: PHILADELPHIA REFINERY

Collected: 10/18/2012 09:00 by MH

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 10/19/2012 13:55

Reported: 10/30/2012 16:40

S-232

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
	GC/MS Volatiles	SW-846 8260B	ug/l	ug/l	ug/l	
10943	Benzene	71-43-2	80	1	0.5	1
10943	Ethylbenzene	100-41-4	7	1	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	2	1	0.5	1
10943	Toluene	108-88-3	5	1	0.5	1
10943	Xylene (Total)	1330-20-7	5	1	0.5	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/13

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10943	UST BTEX, MTBE in Water	SW-846 8260B	1	Z122982AA	10/24/2012 21:16	Daniel H Heller	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	Z122982AA	10/24/2012 21:16	Daniel H Heller	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 10/30/12 at 04:40 PM

Group Number: 1343585

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank LOQ**</u>	<u>Blank MDL</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: P123011AA				Sample number(s): 6830657					
Benzene	< 1	1.	0.5	ug/l	92		77-121		
Batch number: Z122982AA				Sample number(s): 6830656-6830658					
Benzene	< 1	1.	0.5	ug/l	95		77-121		
Ethylbenzene	< 1	1.	0.5	ug/l	102		79-120		
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	84		68-121		
Toluene	< 1	1.	0.5	ug/l	101		79-120		
Xylene (Total)	< 1	1.	0.5	ug/l	105		77-120		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD RPD</u>	<u>BKG MAX Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: P123011AA			Sample number(s): 6830657 UNSPK: P834403					
Benzene	97	98	72-134	1	30			
Batch number: Z122982AA			Sample number(s): 6830656-6830658 UNSPK: P830124					
Benzene	59 (2)	59 (2)	72-134	0	30			
Ethylbenzene	109	114	71-134	5	30			
Methyl Tertiary Butyl Ether	83	88	72-126	6	30			
Toluene	99	105	80-125	4	30			
Xylene (Total)	109	113	79-125	3	30			

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: UST BTEX, MTBE in Water

Batch number: P123011AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
Blank	104	101	99	97
LCS	106	104	98	

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(1) The result for one or both determinations was less than five times the LOQ.

(2) The unspiked result was more than four times the spike added.

Quality Control SummaryClient Name: SUN: Aquaterra Tech.
Reported: 10/30/12 at 04:40 PM

Group Number: 1343585

Surrogate Quality Control

MS	105	104	99	99
MSD	106	104	98	97

Limits:	80-116	77-113	80-113	78-113
---------	--------	--------	--------	--------

Analysis Name: UST BTEX, MTBE in Water
Batch number: Z122982AA

Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
----------------------	-----------------------	------------	----------------------

6830656	89	89	101	96
6830657	82	82	101	98
6830658	84	89	101	98
Blank	94	95	98	92
LCS	92	96	98	98
MS	90	91	99	97
MSD	90	88	100	100

Limits:	80-116	77-113	80-113	78-113
---------	--------	--------	--------	--------

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(1) The result for one or both determinations was less than five times the LOQ.

(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody



**Lancaster
Laboratories**

Acct. # 134
10132

For Eurofins Lancaster Laboratories use only
Group # 1343585 Sample # 6830656-59
Instructions on reverse side correspond with circled numbers.

COC # 316626

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	BMQL	Below Minimum Quantitation Level
N.D.	none detected	MPN	Most Probable Number
TNTC	Too Numerous To Count	CP Units	cobalt-chloroplatinate units
IU	International Units	NTU	nephelometric turbidity units
umhos/cm	micromhos/cm	ng	nanogram(s)
C	degrees Celsius	F	degrees Fahrenheit
meq	milliequivalents	lb.	pound(s)
g	gram(s)	kg	kilogram(s)
µg	microgram(s)	mg	milligram(s)
mL	milliliter(s)	L	liter(s)
m³	cubic meter(s)	µL	microliter(s)
		pg/L	picogram/liter
<	less than - The number following the sign is the <u>limit of quantitation</u> , the smallest amount of analyte which can be reliably determined using this specific test.		
>	greater than		
J	estimated value – The result is \geq the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).		
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.		
ppb	parts per billion		
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

- A** TIC is a possible aldol-condensation product
- B** Analyte was also detected in the blank
- C** Pesticide result confirmed by GC/MS
- D** Compound quantitated on a diluted sample
- E** Concentration exceeds the calibration range of the instrument
- N** Presumptive evidence of a compound (TICs only)
- P** Concentration difference between primary and confirmation columns $>25\%$
- U** Compound was not detected
- X,Y,Z** Defined in case narrative

Inorganic Qualifiers

- B** Value is <CRDL, but \geq IDL
- E** Estimated due to interference
- M** Duplicate injection precision not met
- N** Spike sample not within control limits
- S** Method of standard additions (MSA) used for calculation
- U** Compound was not detected
- W** Post digestion spike out of control limits
- * Duplicate analysis not within control limits
- + Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as "analyze immediately" are not performed within 15 minutes.

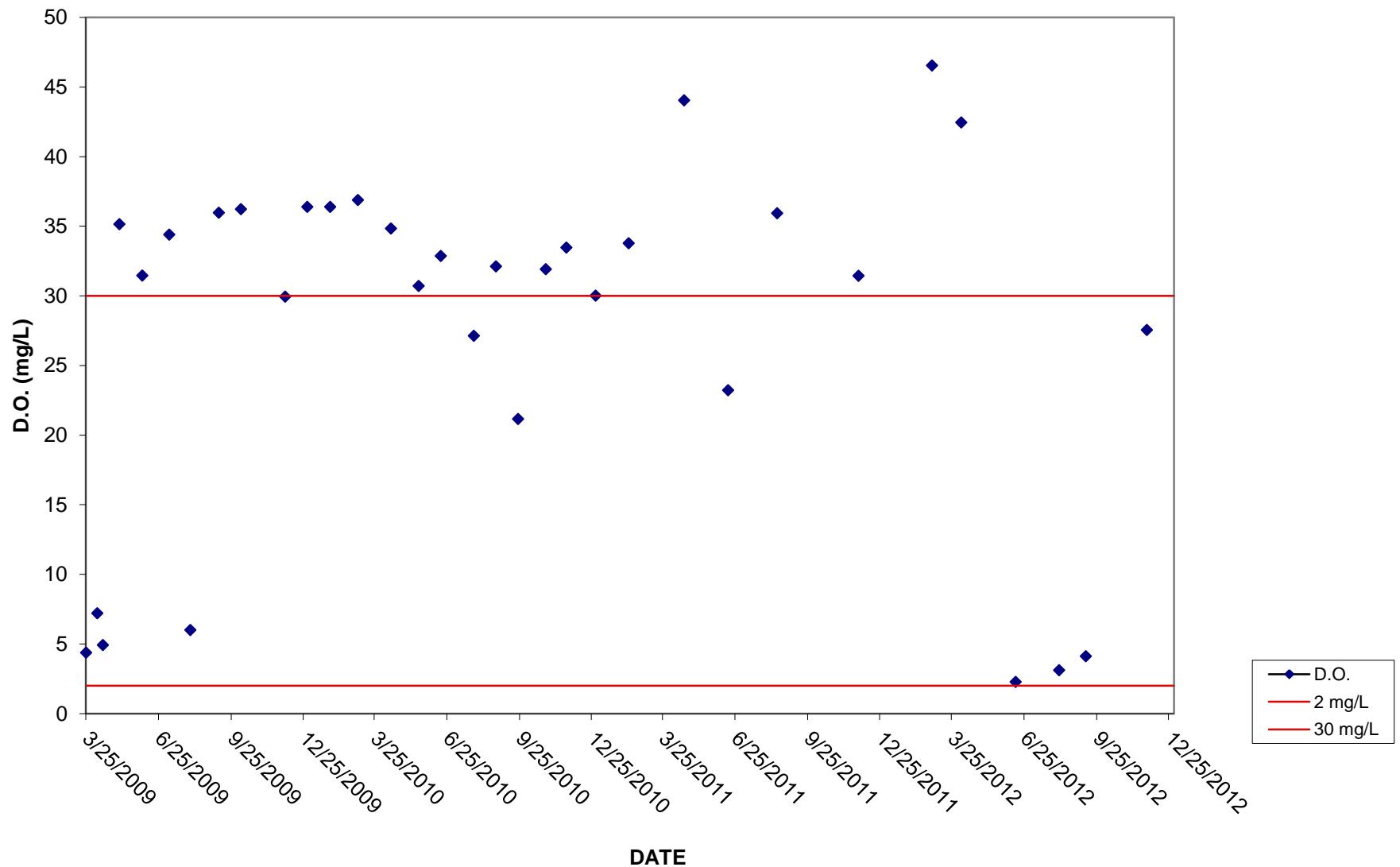
WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL LANCASTER LABORATORIES BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF LANCASTER LABORATORIES AND (B) WHETHER LANCASTER LABORATORIES HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Lancaster Laboratories which includes any conditions that vary from the Standard Terms and Conditions, and Lancaster hereby objects to any conflicting terms contained in any acceptance or order submitted by client.



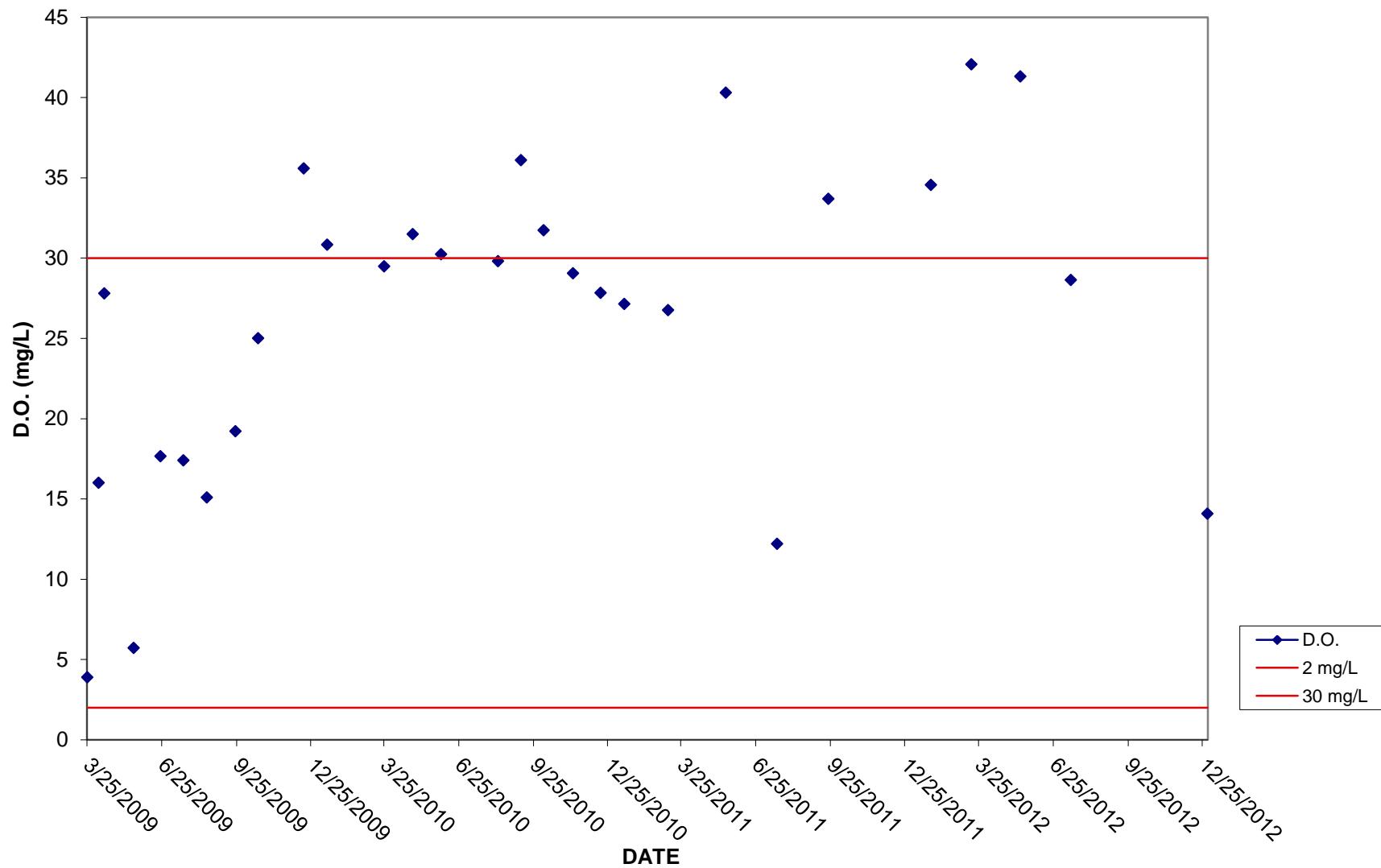
ATTACHMENT B

DO Graphs for System Wells

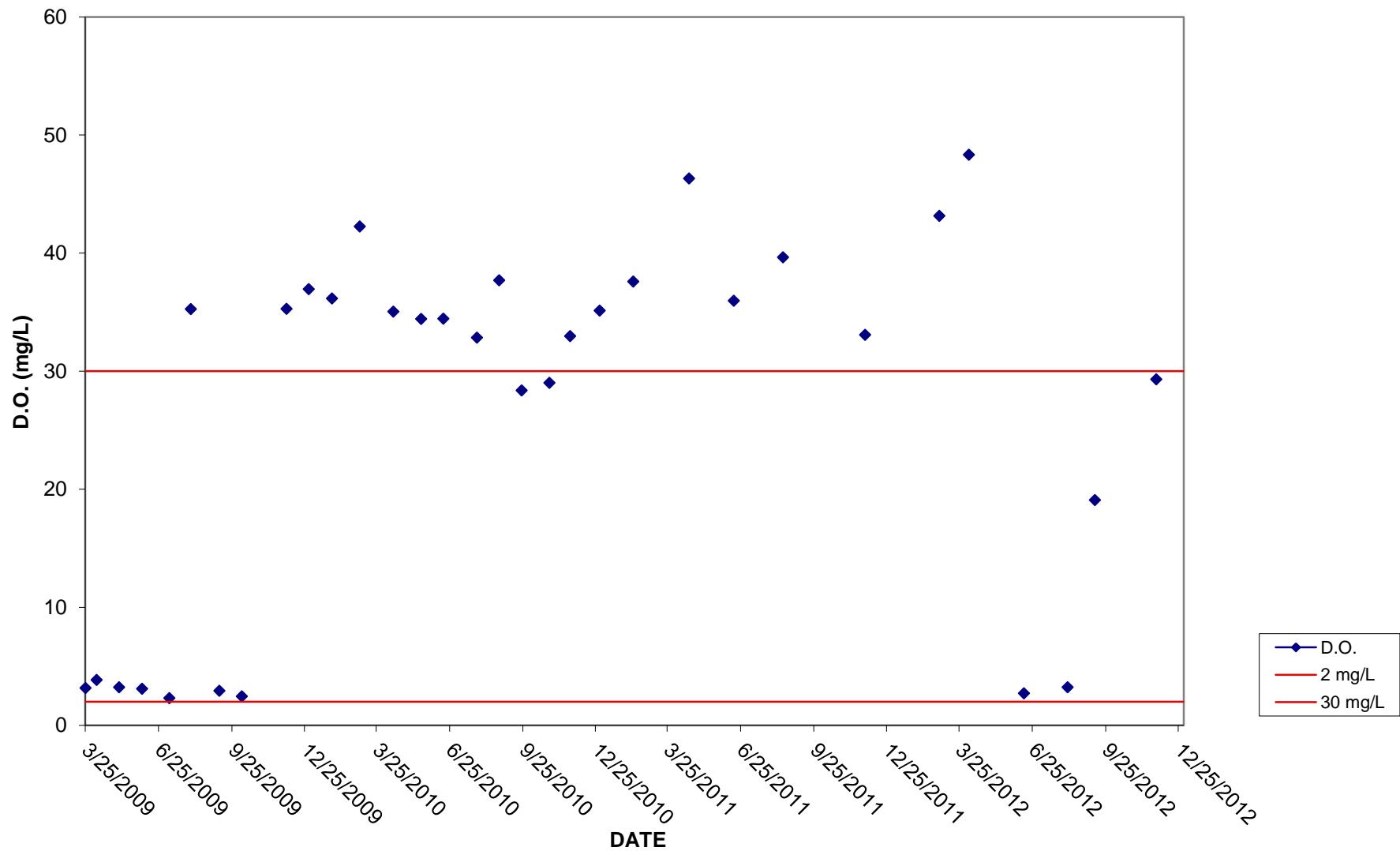
IW-1S D.O. FIELD DATA vs TIME



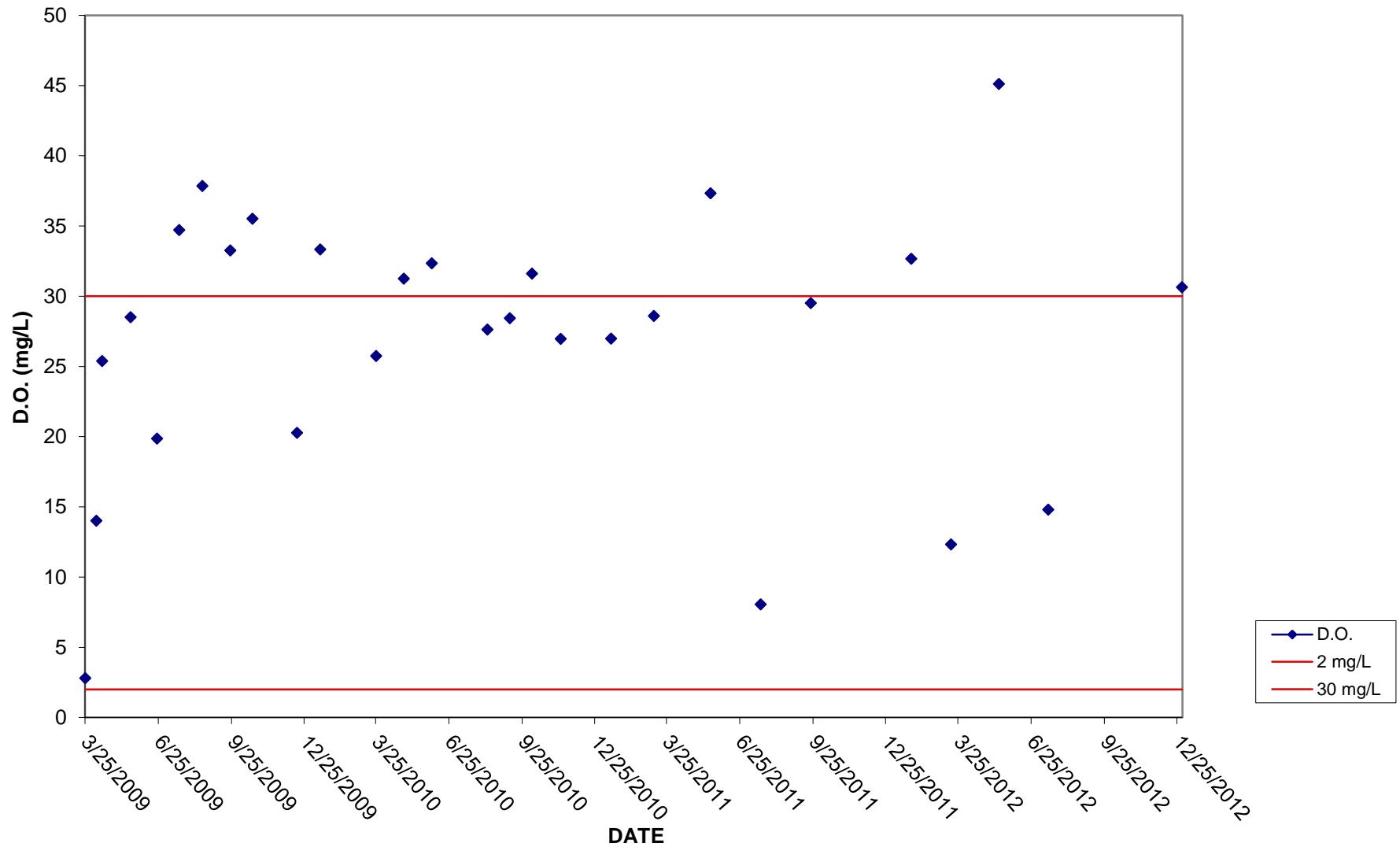
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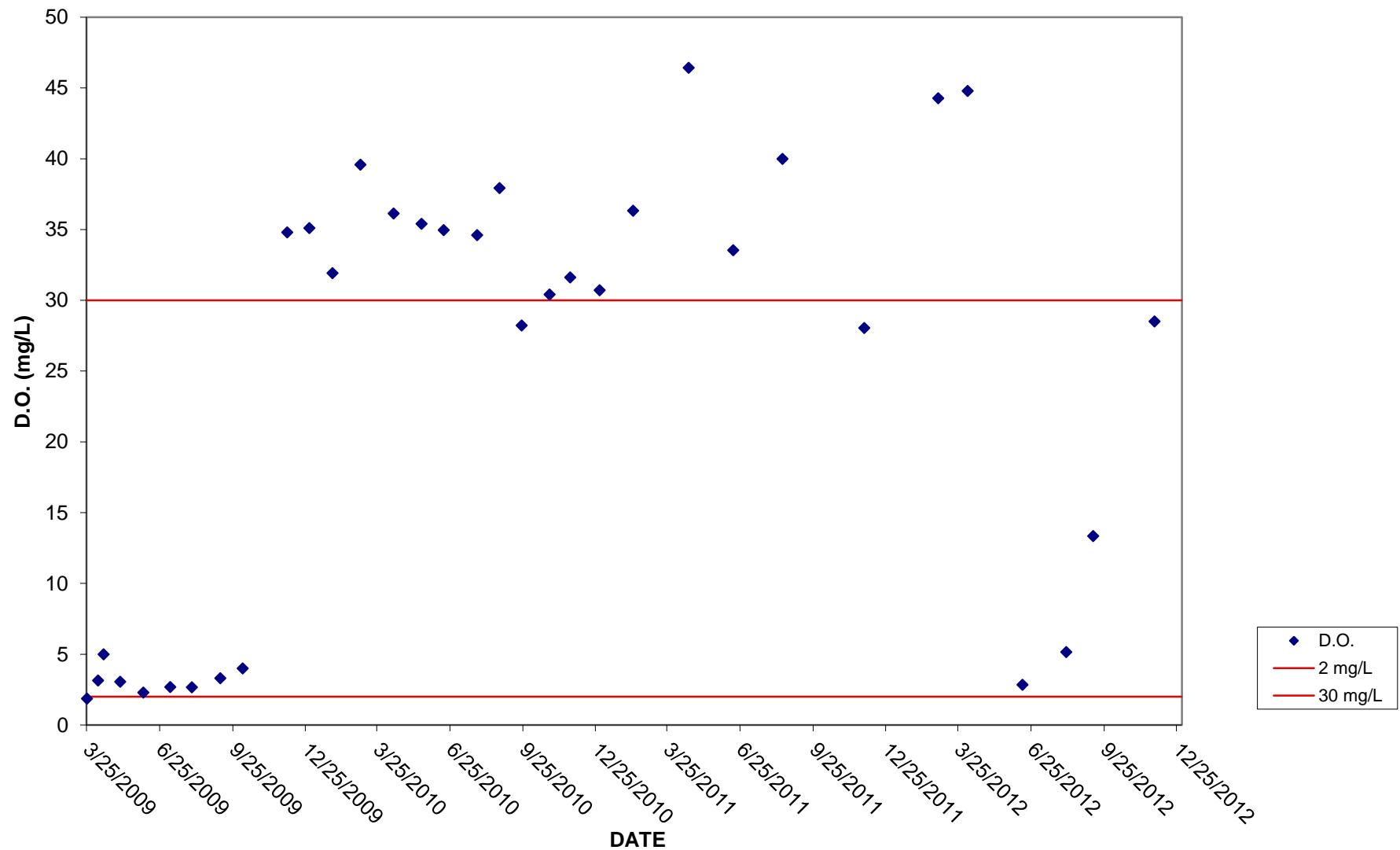
IW-3S D.O. FIELD DATA vs TIME



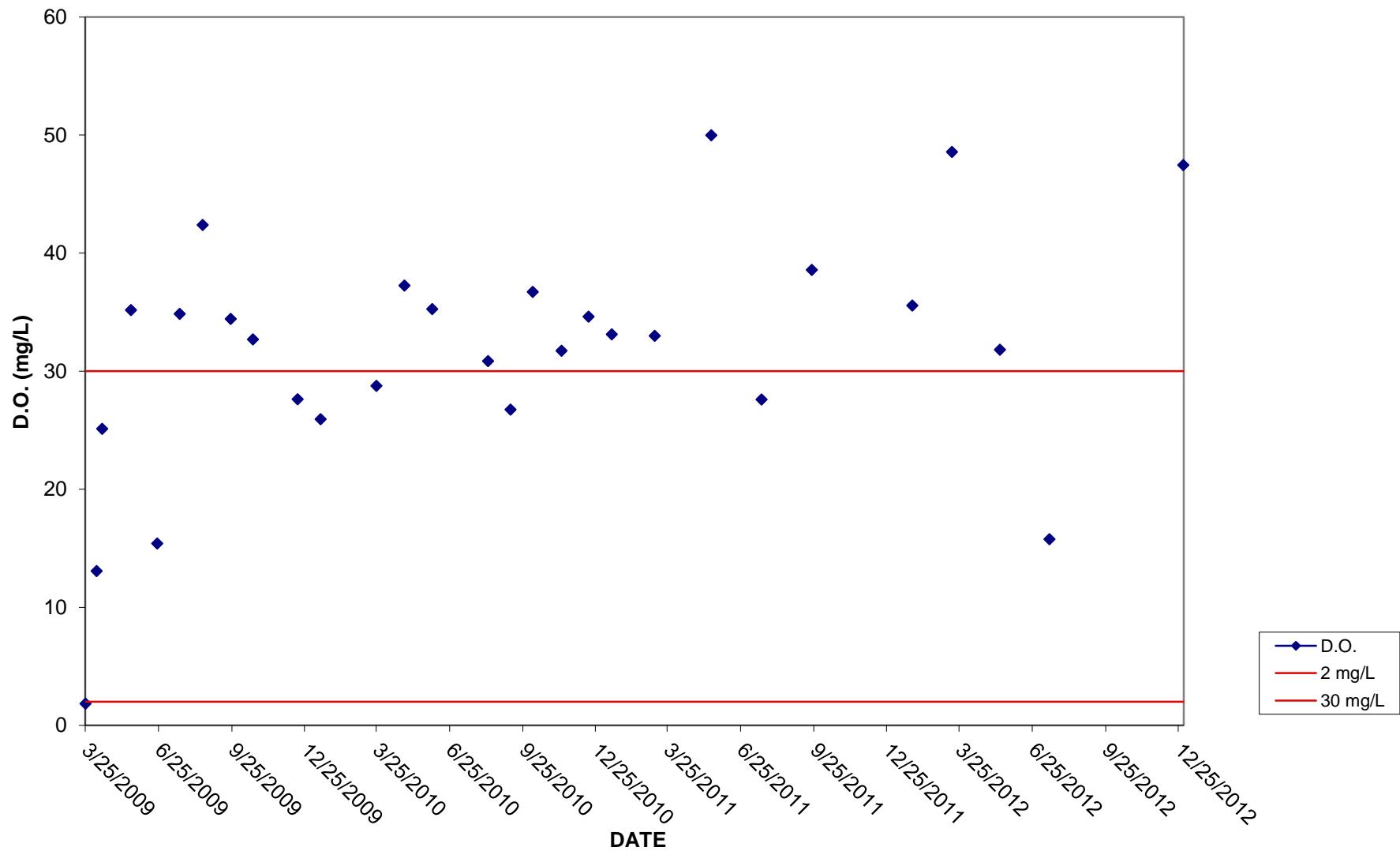
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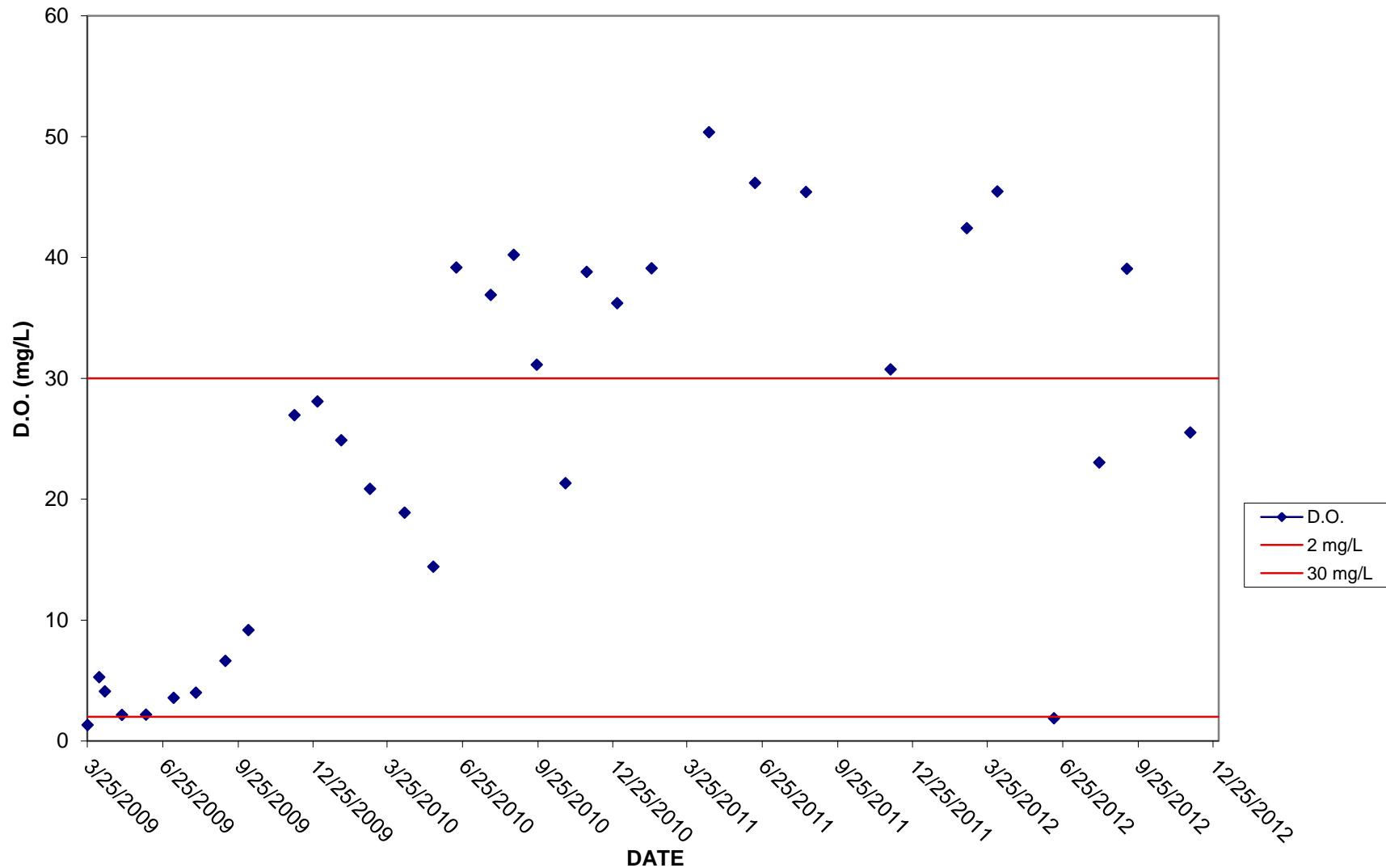
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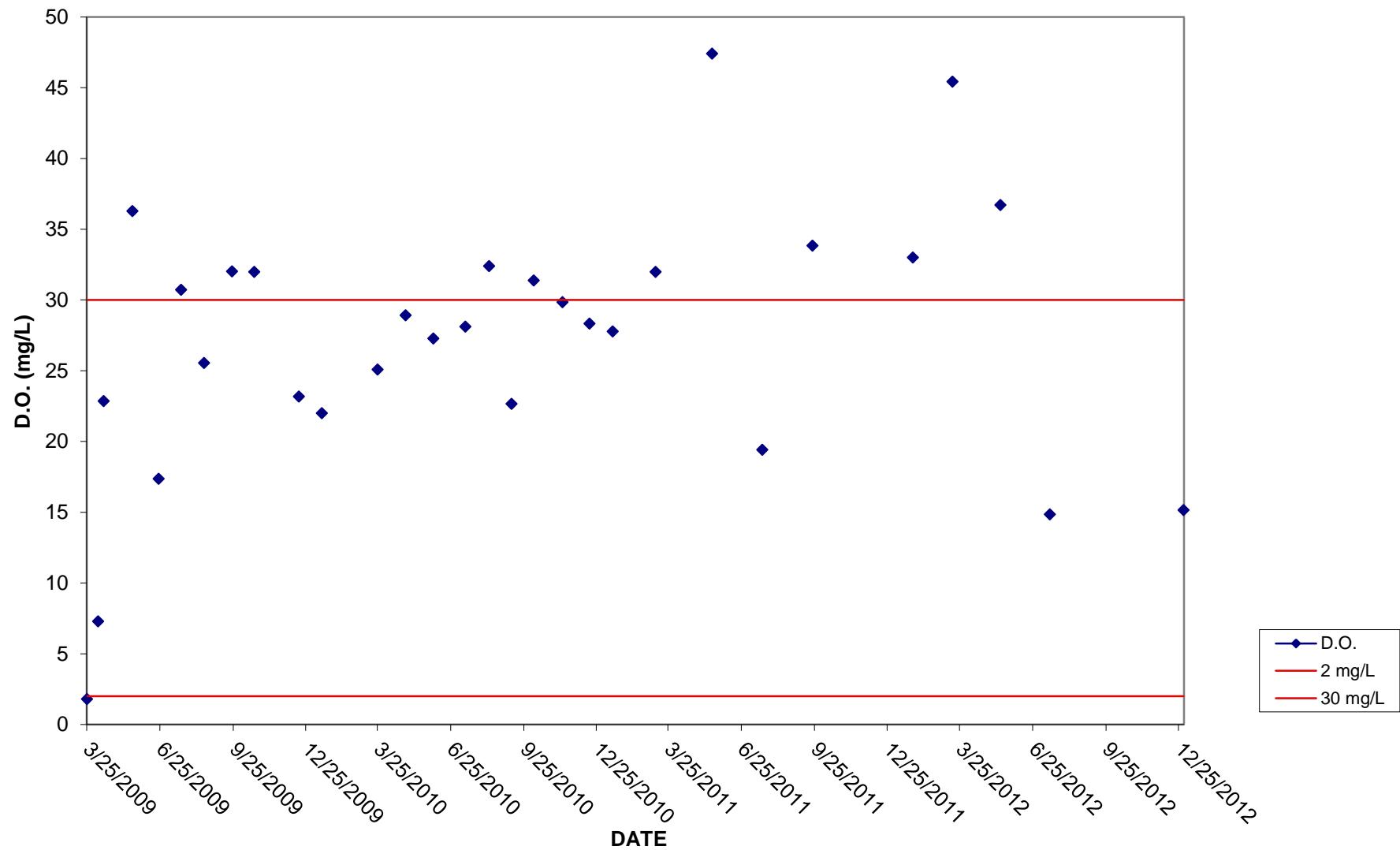
IW-6S D.O. FIELD DATA vs TIME



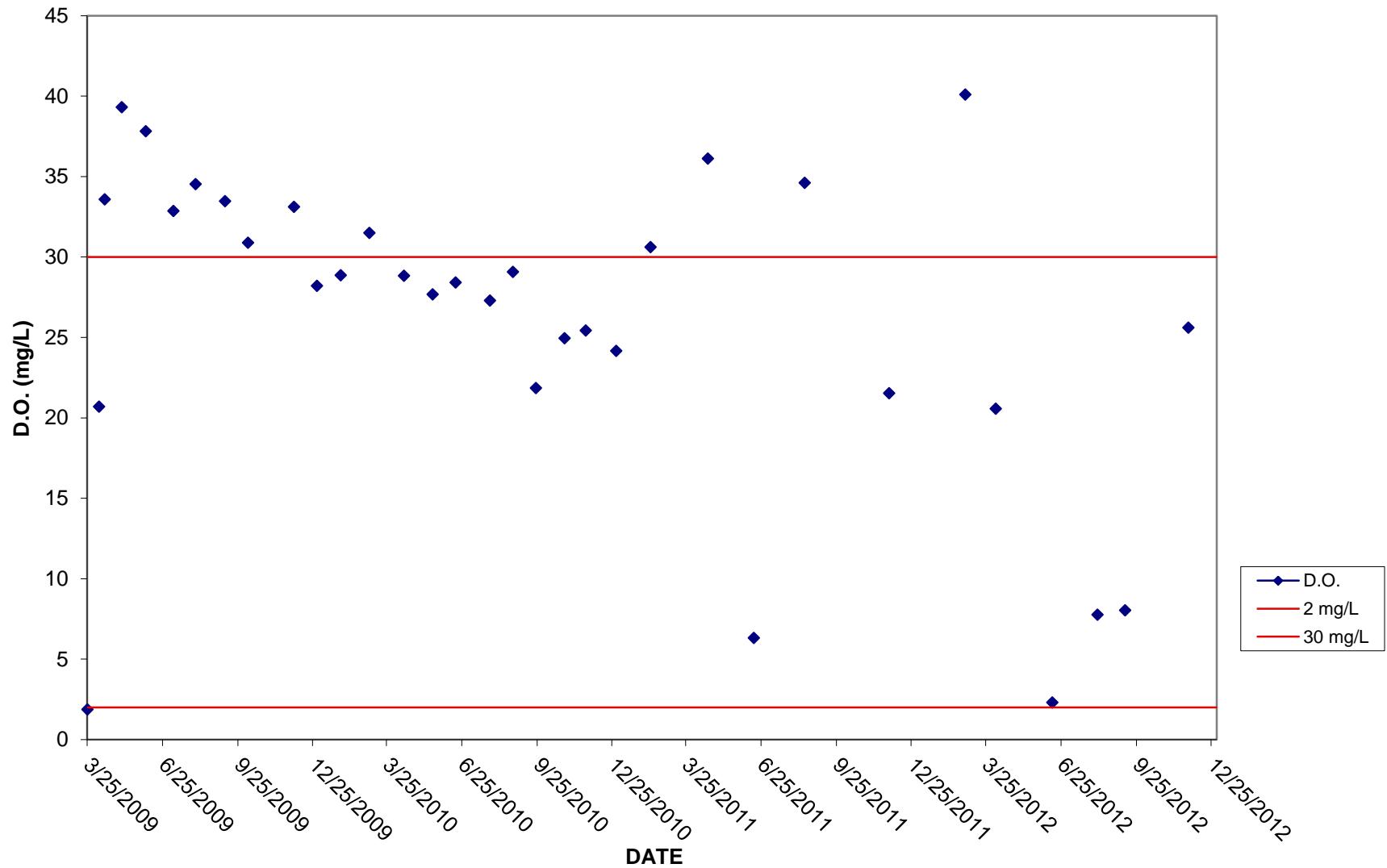
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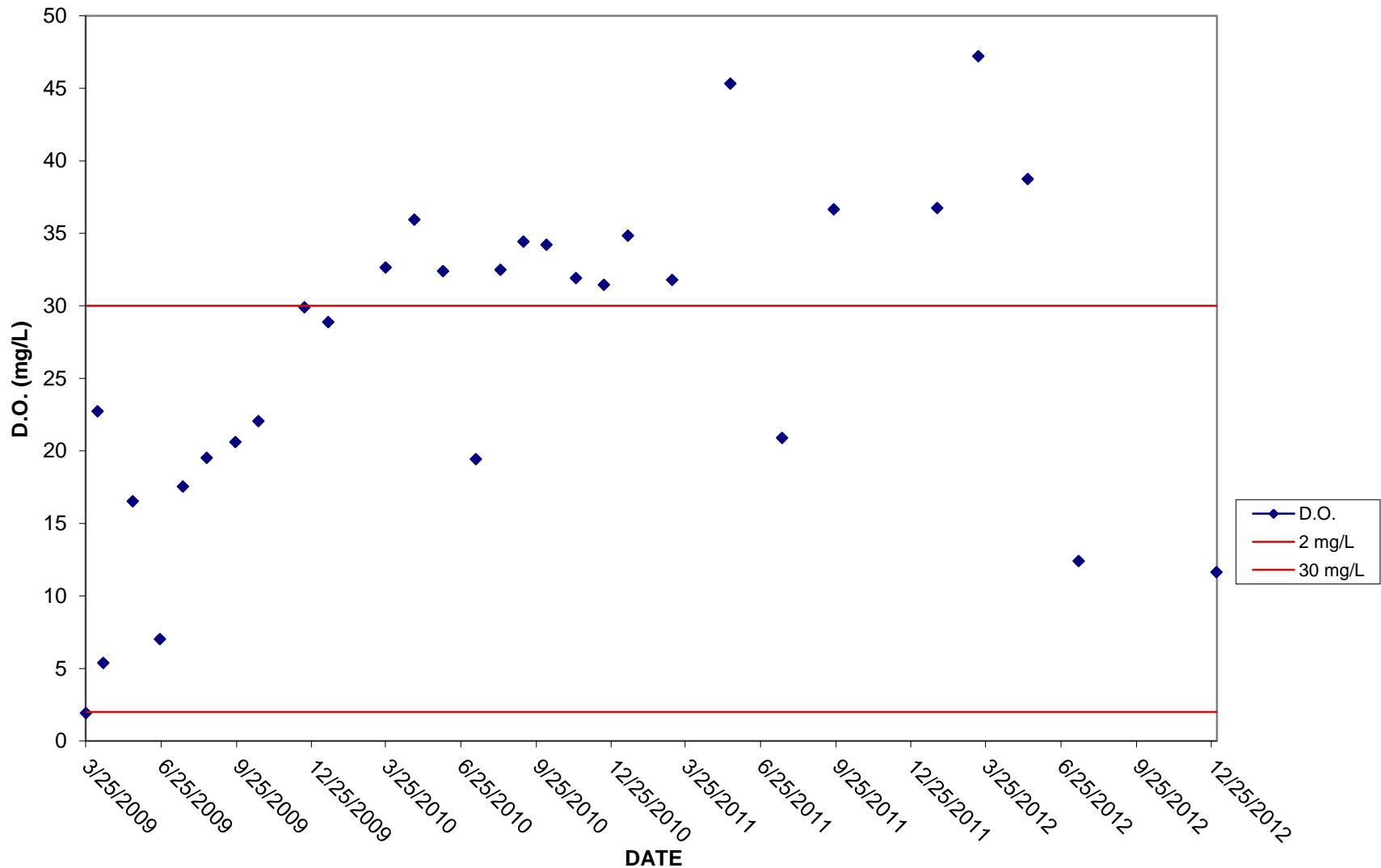
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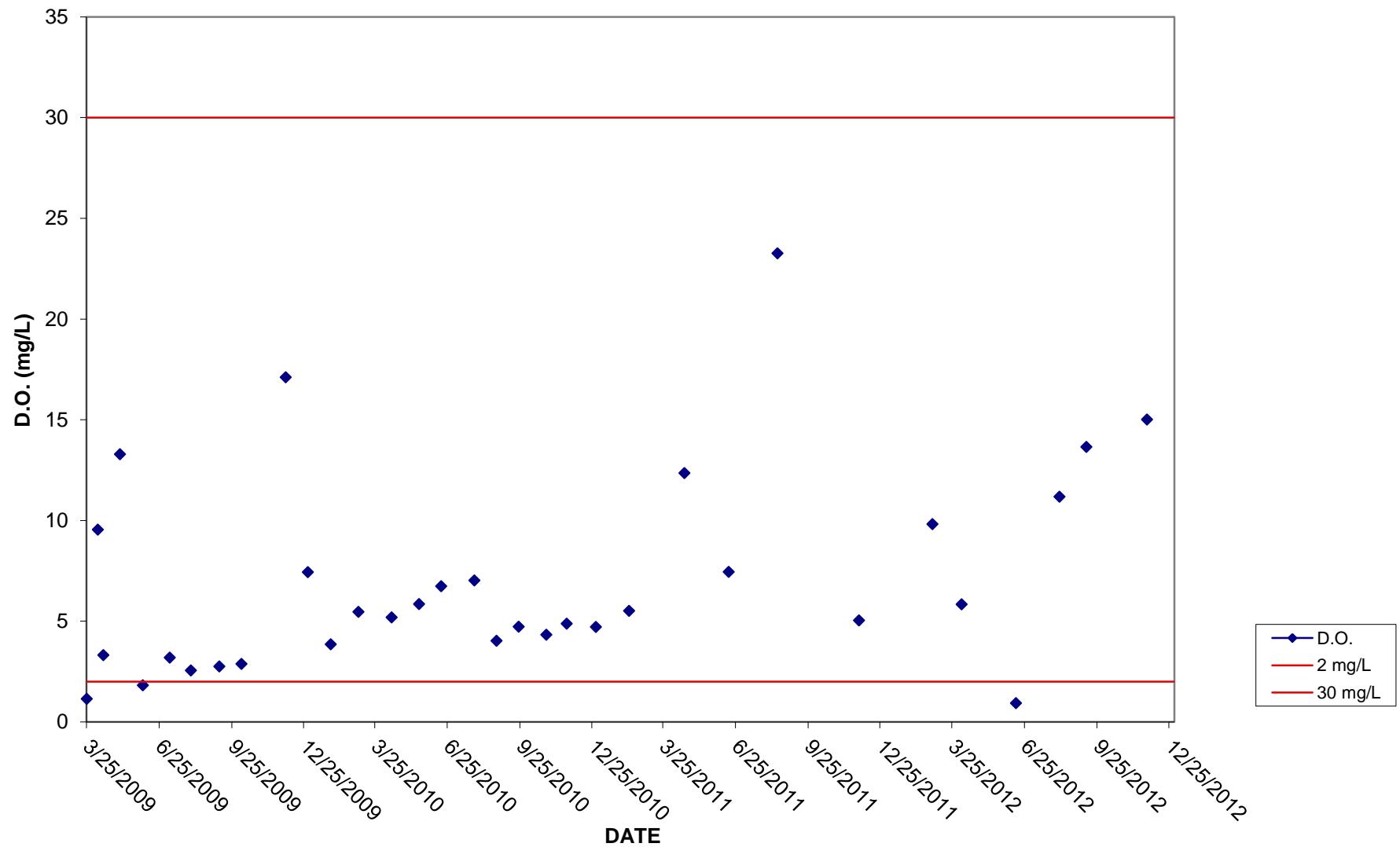
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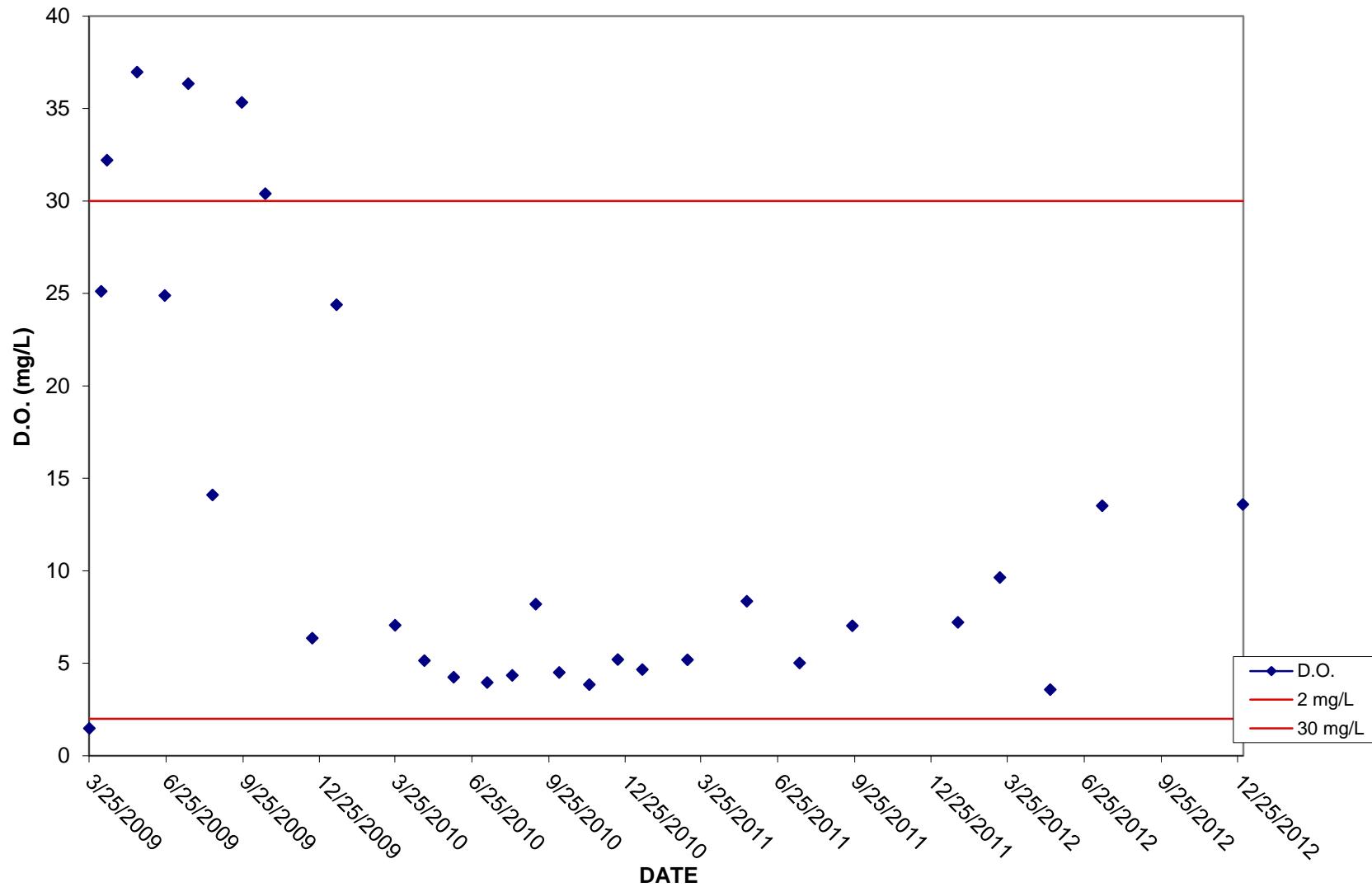
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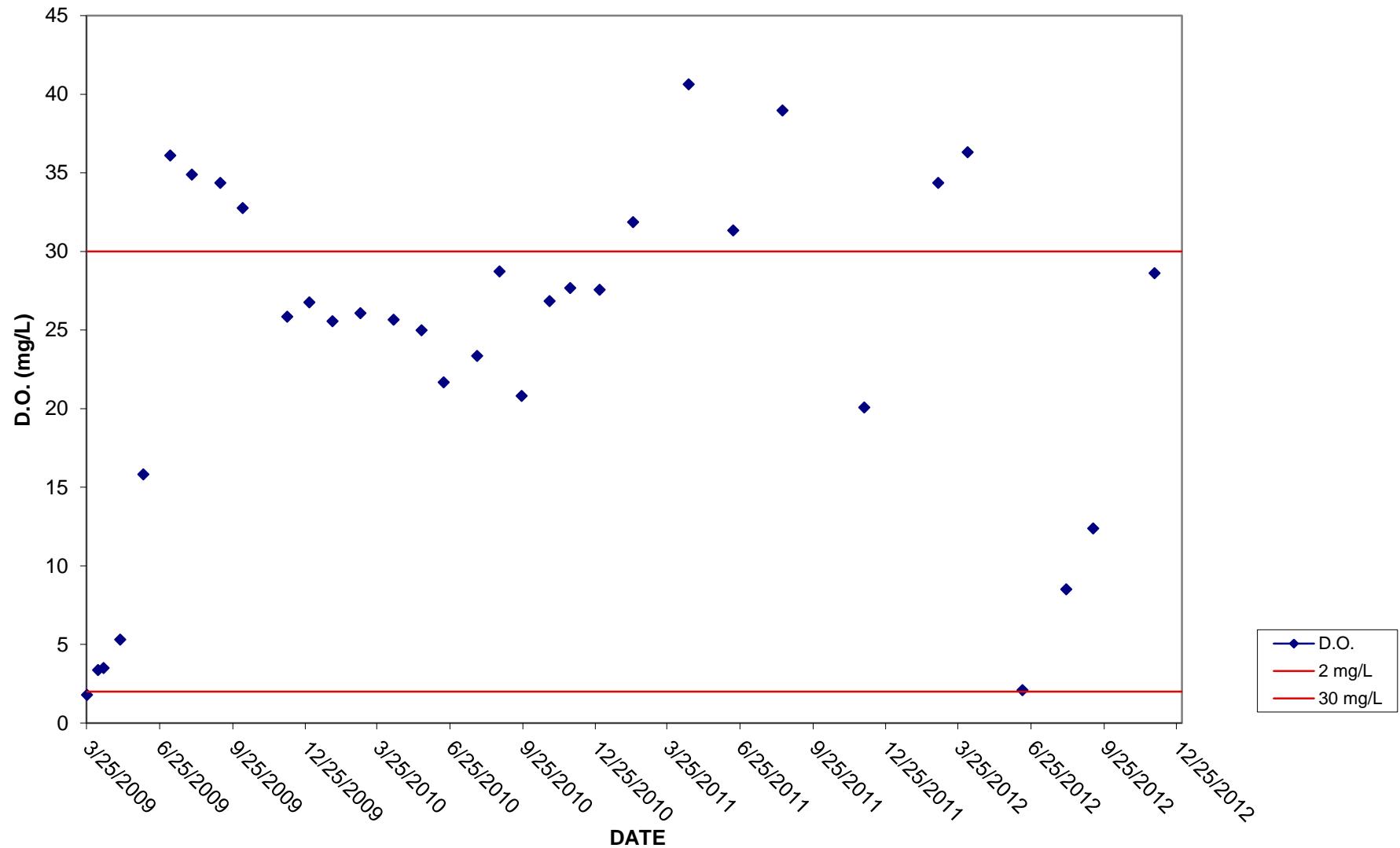
IW-11S D.O. FIELD DATA vs TIME



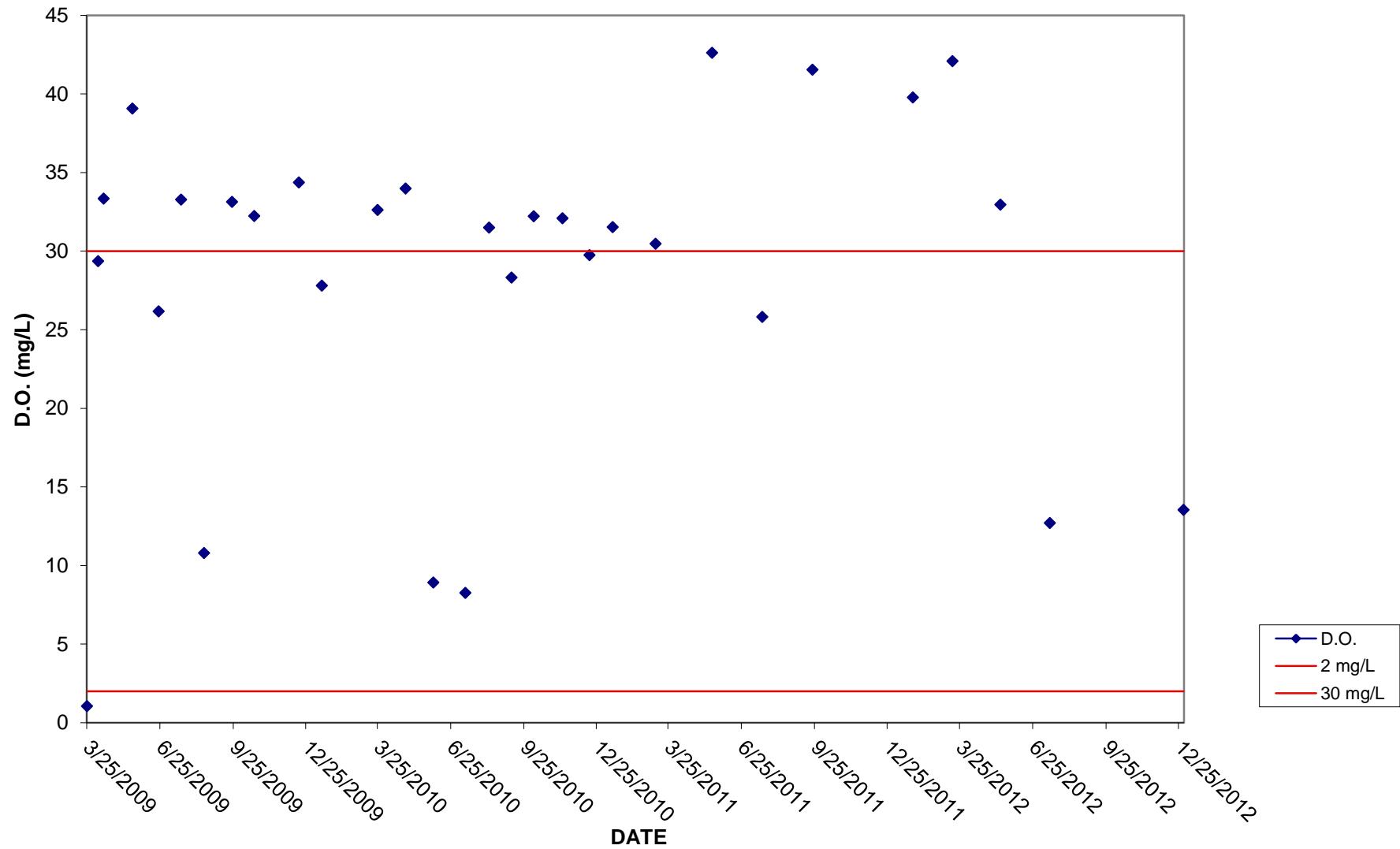
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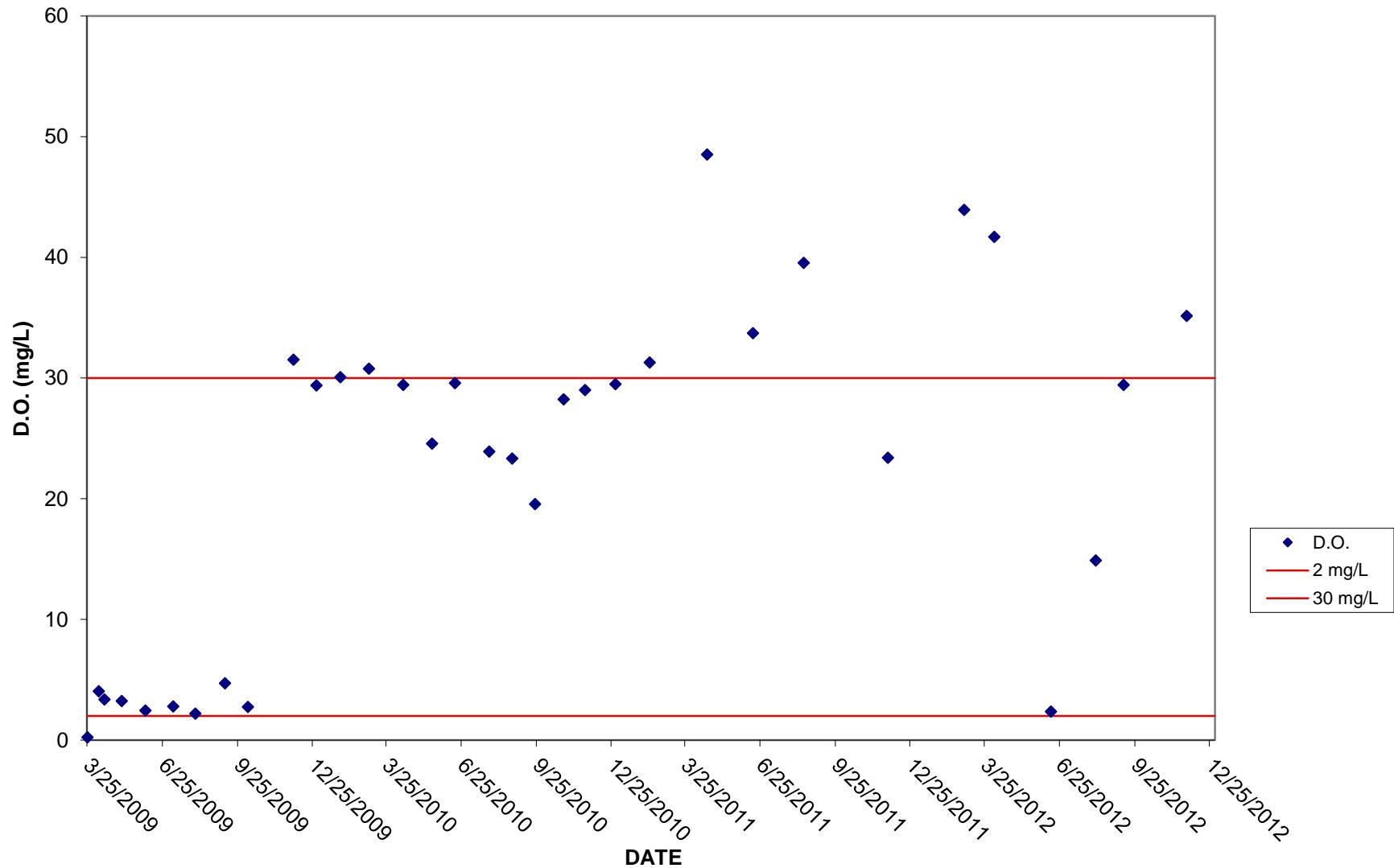
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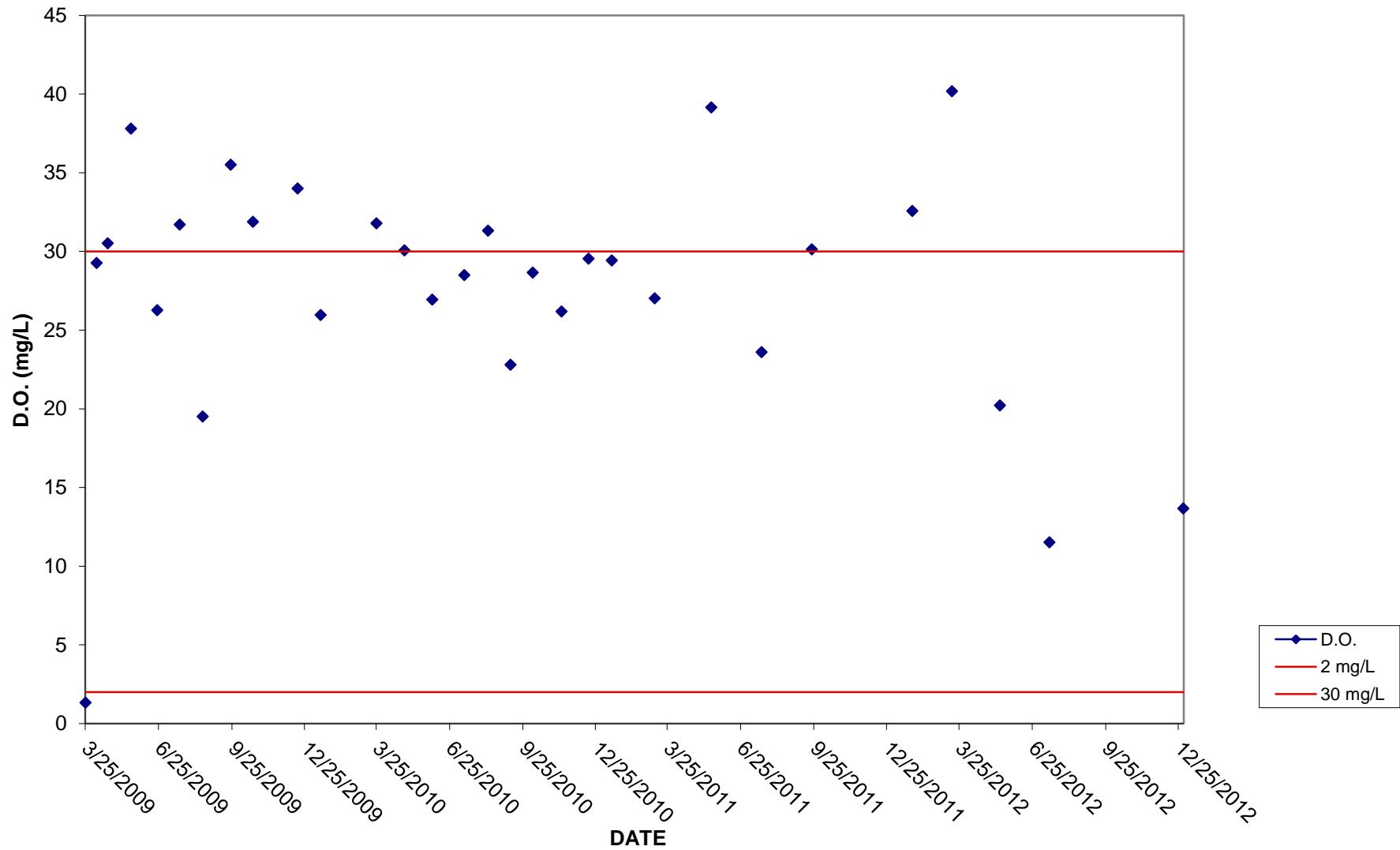
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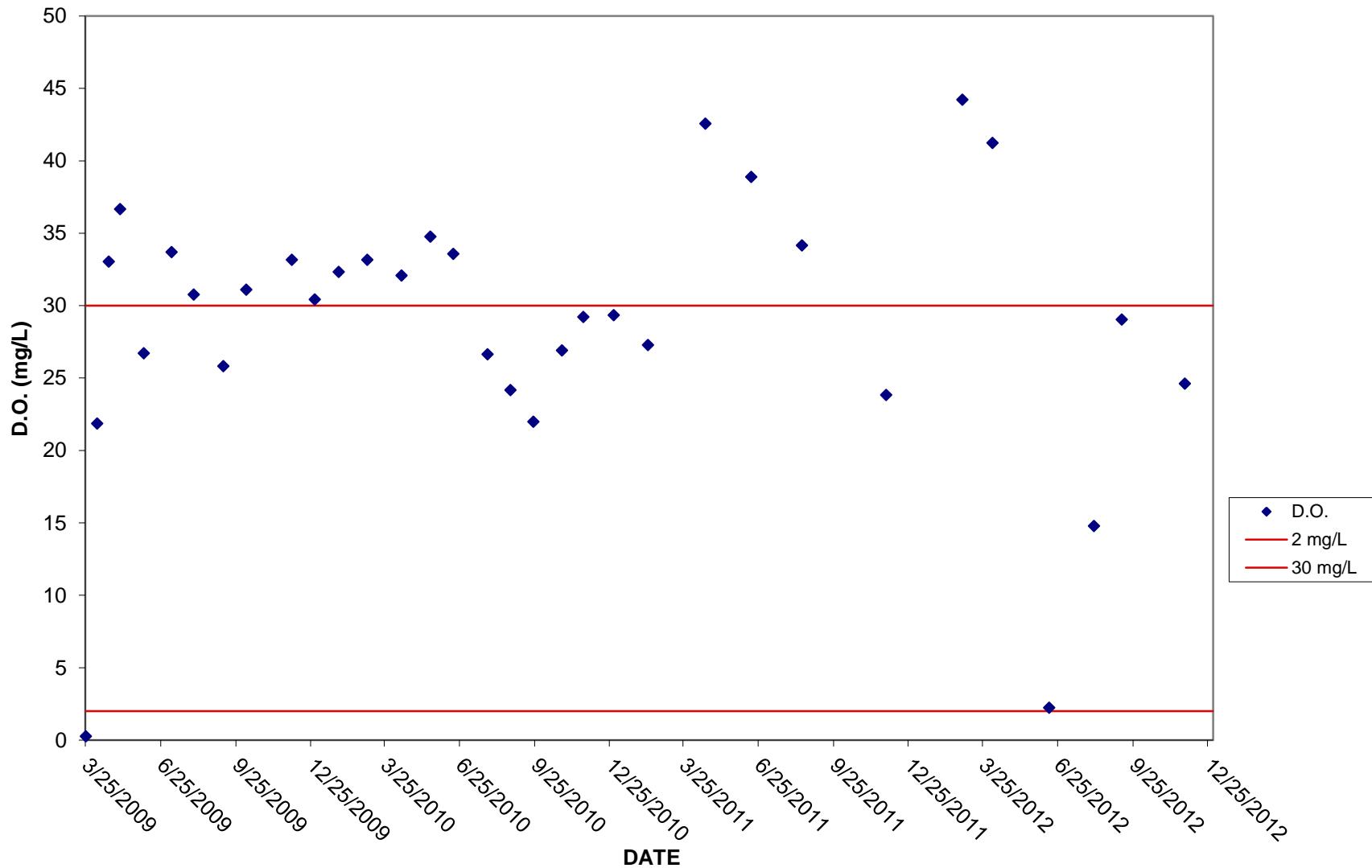
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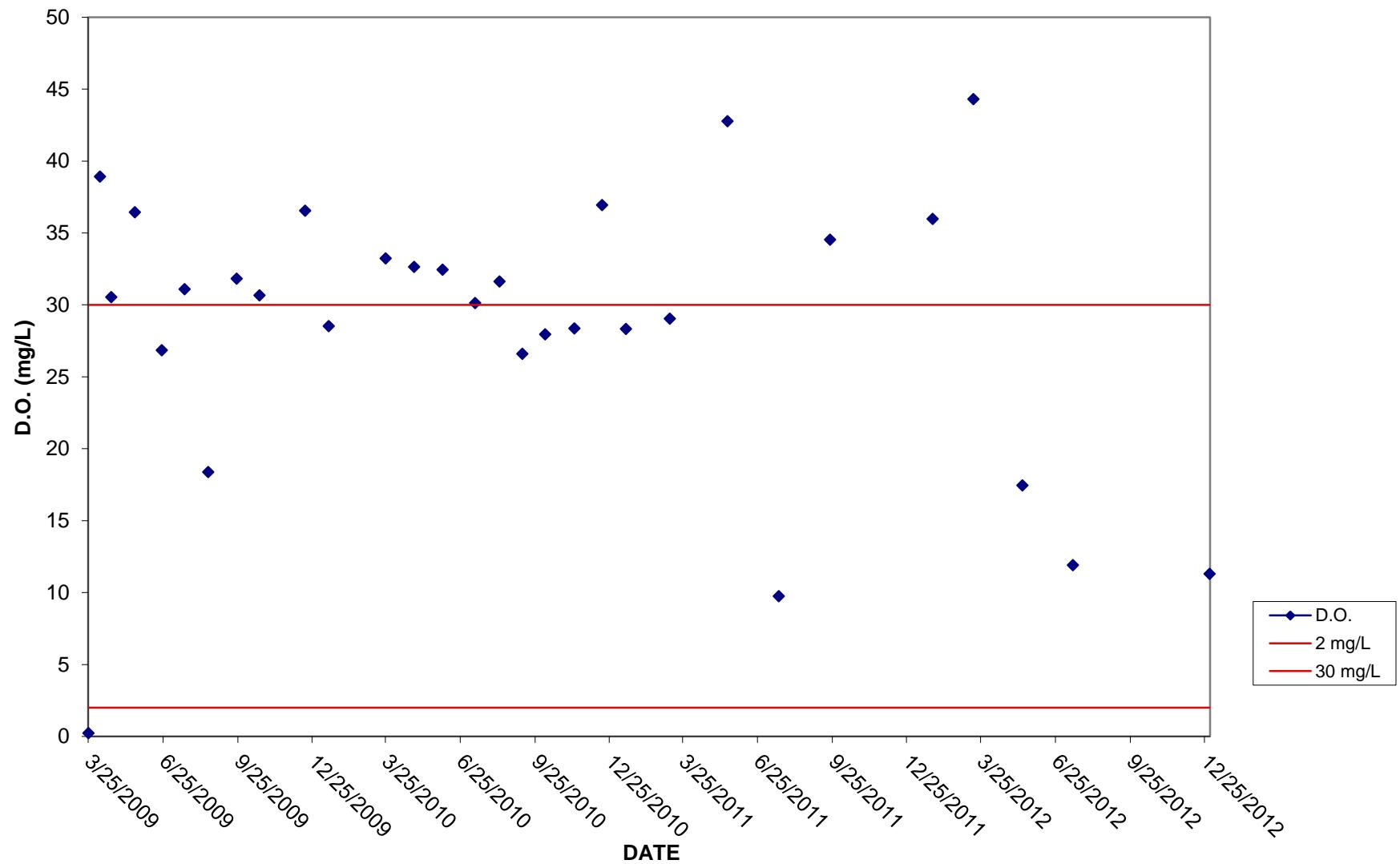
IW-16S D.O. FIELD DATA vs TIME



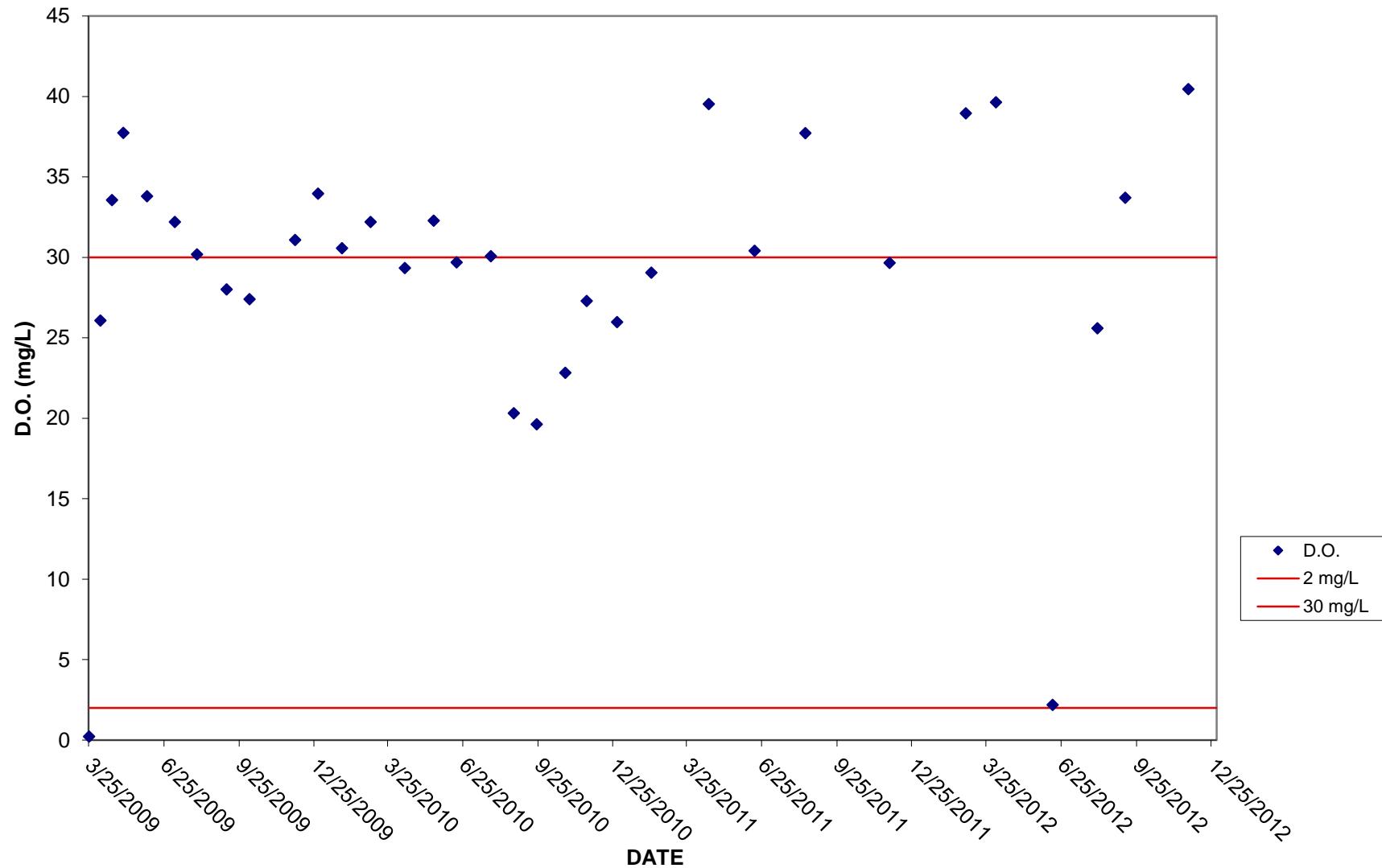
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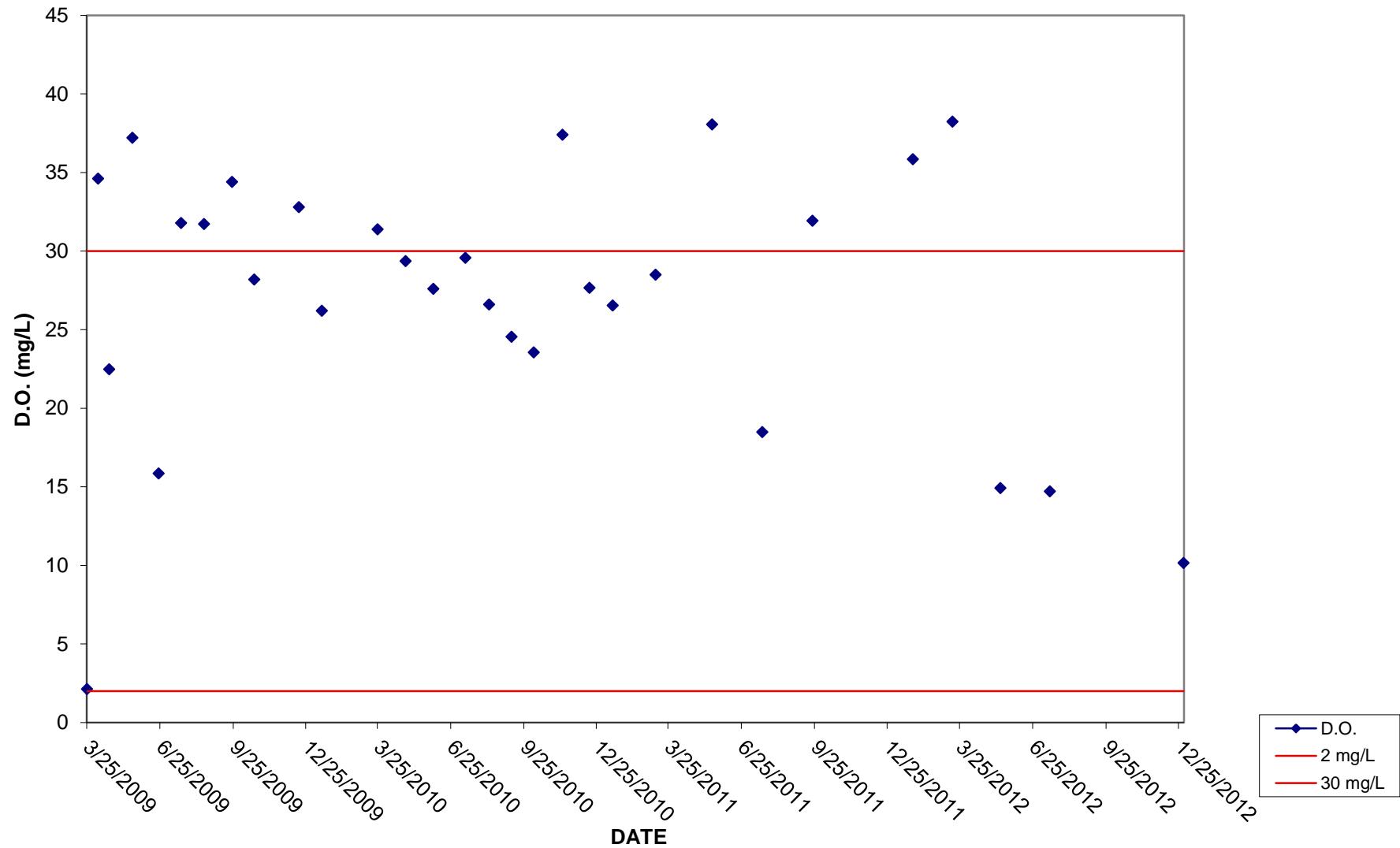
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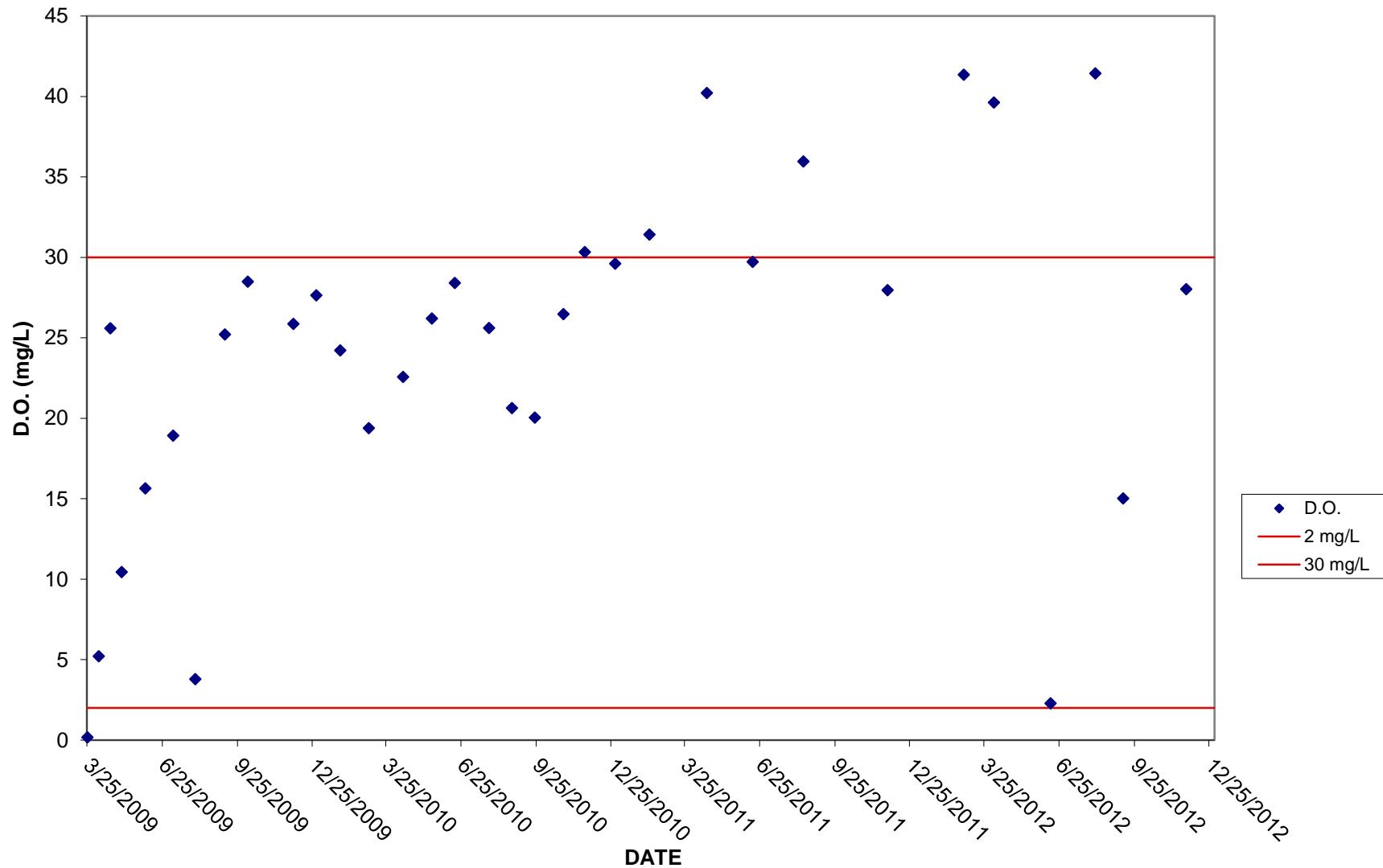
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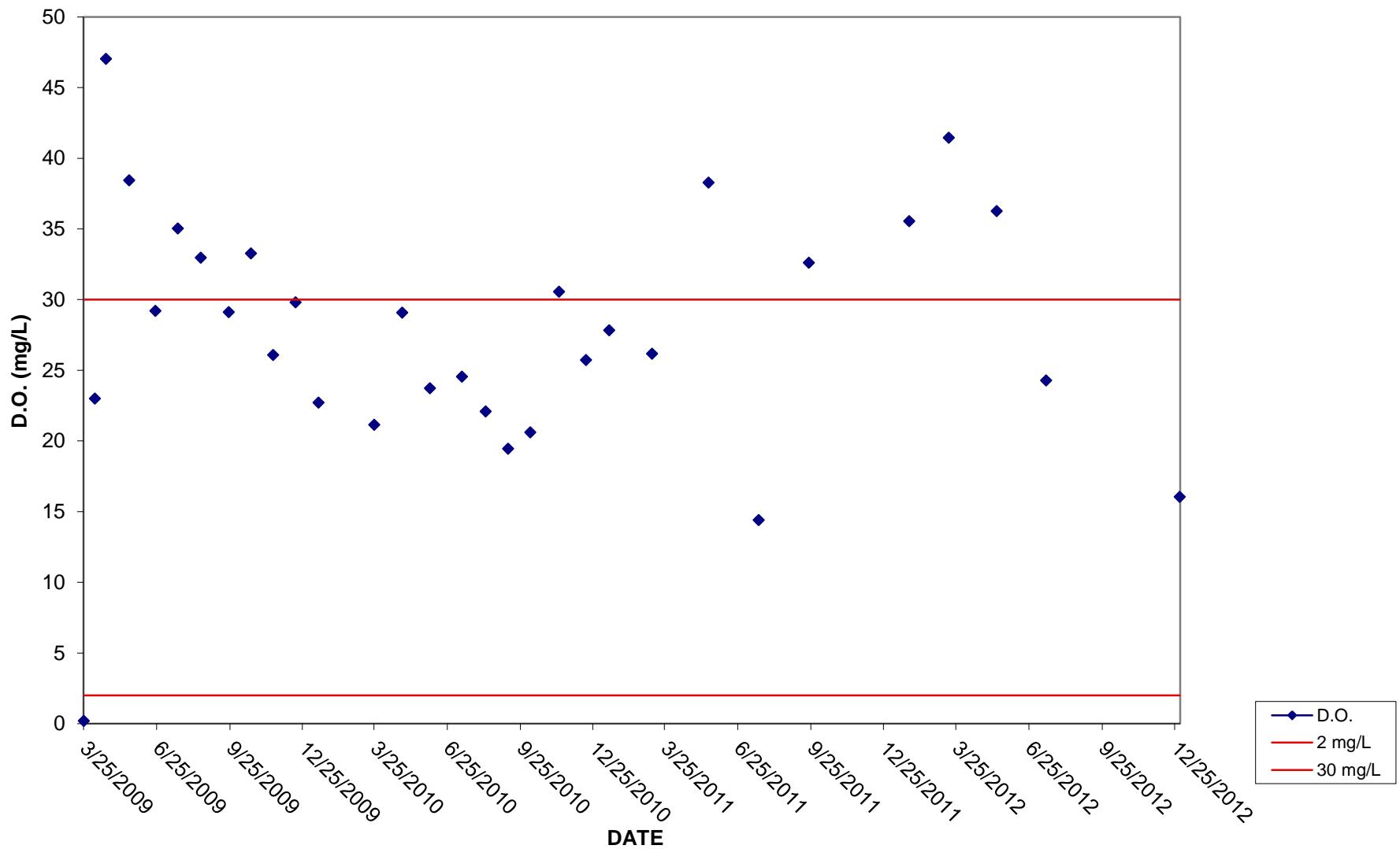
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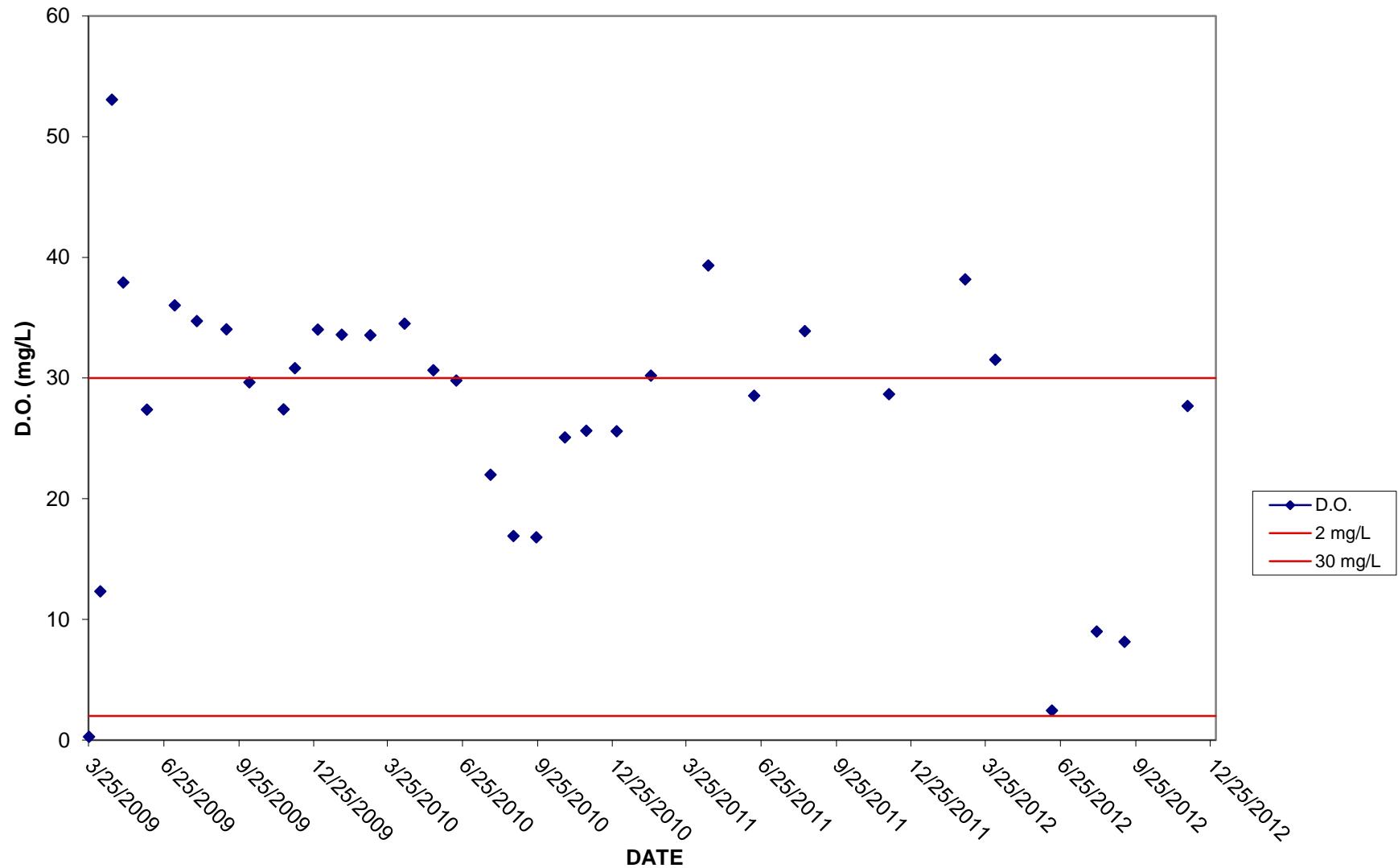
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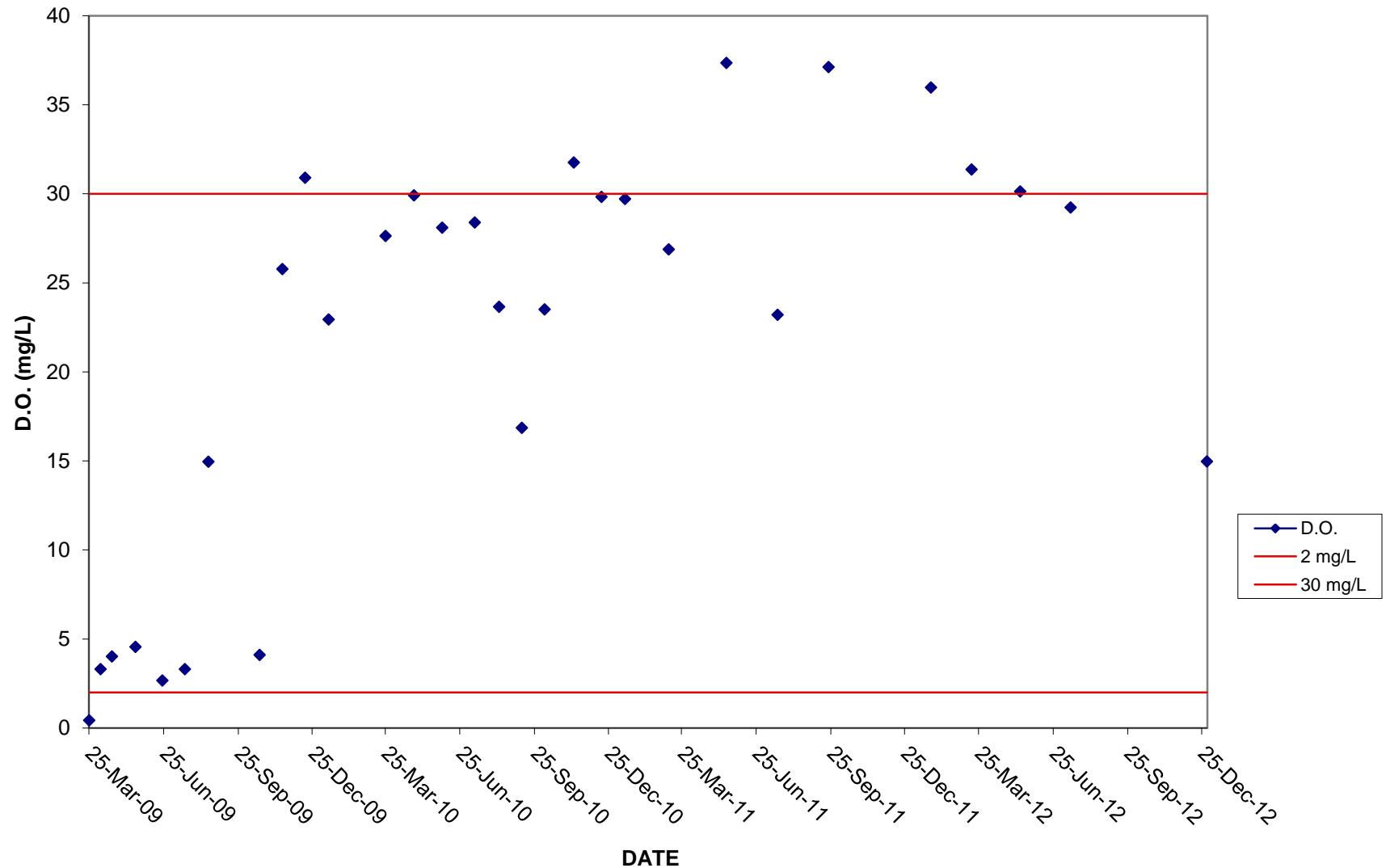
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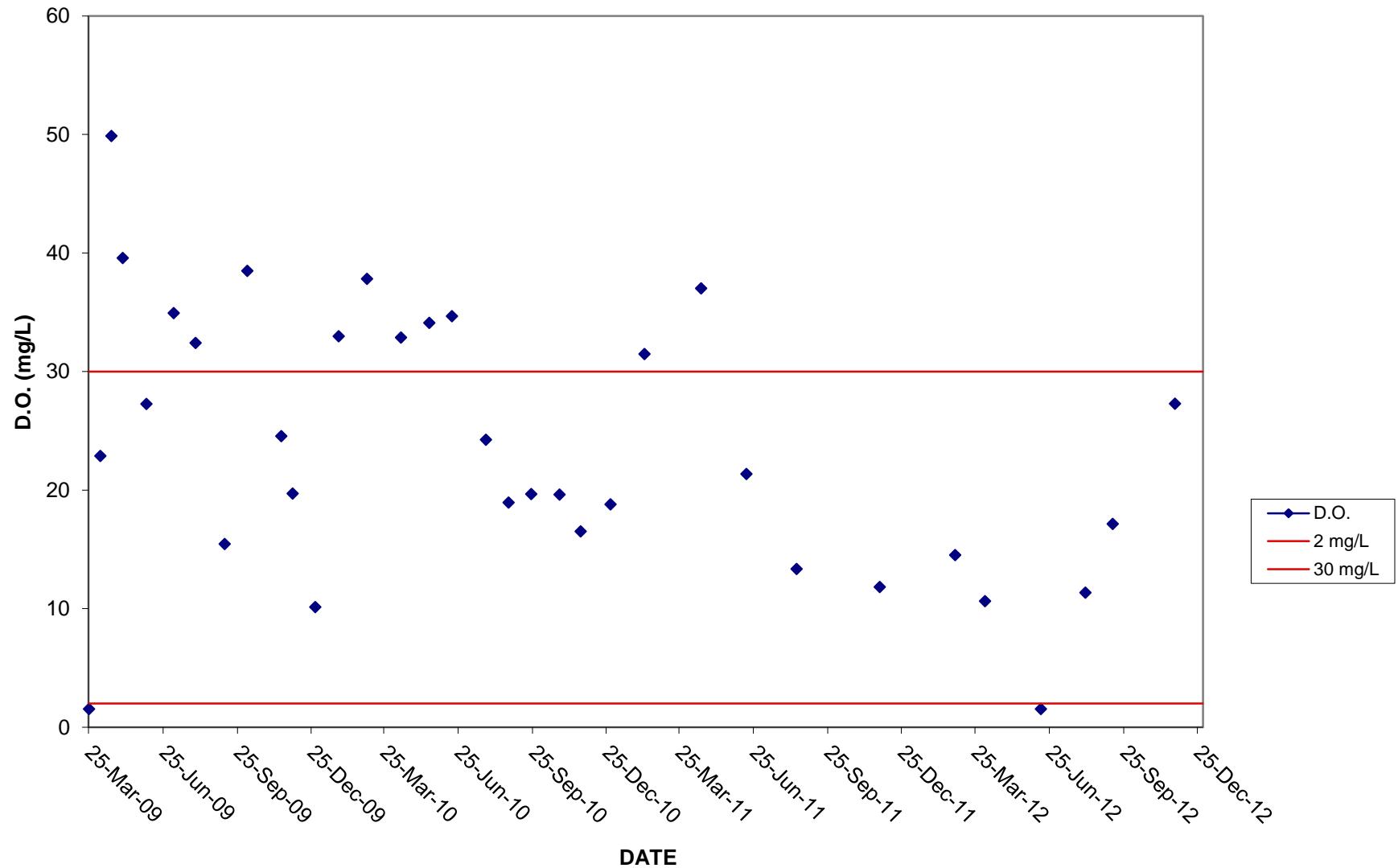
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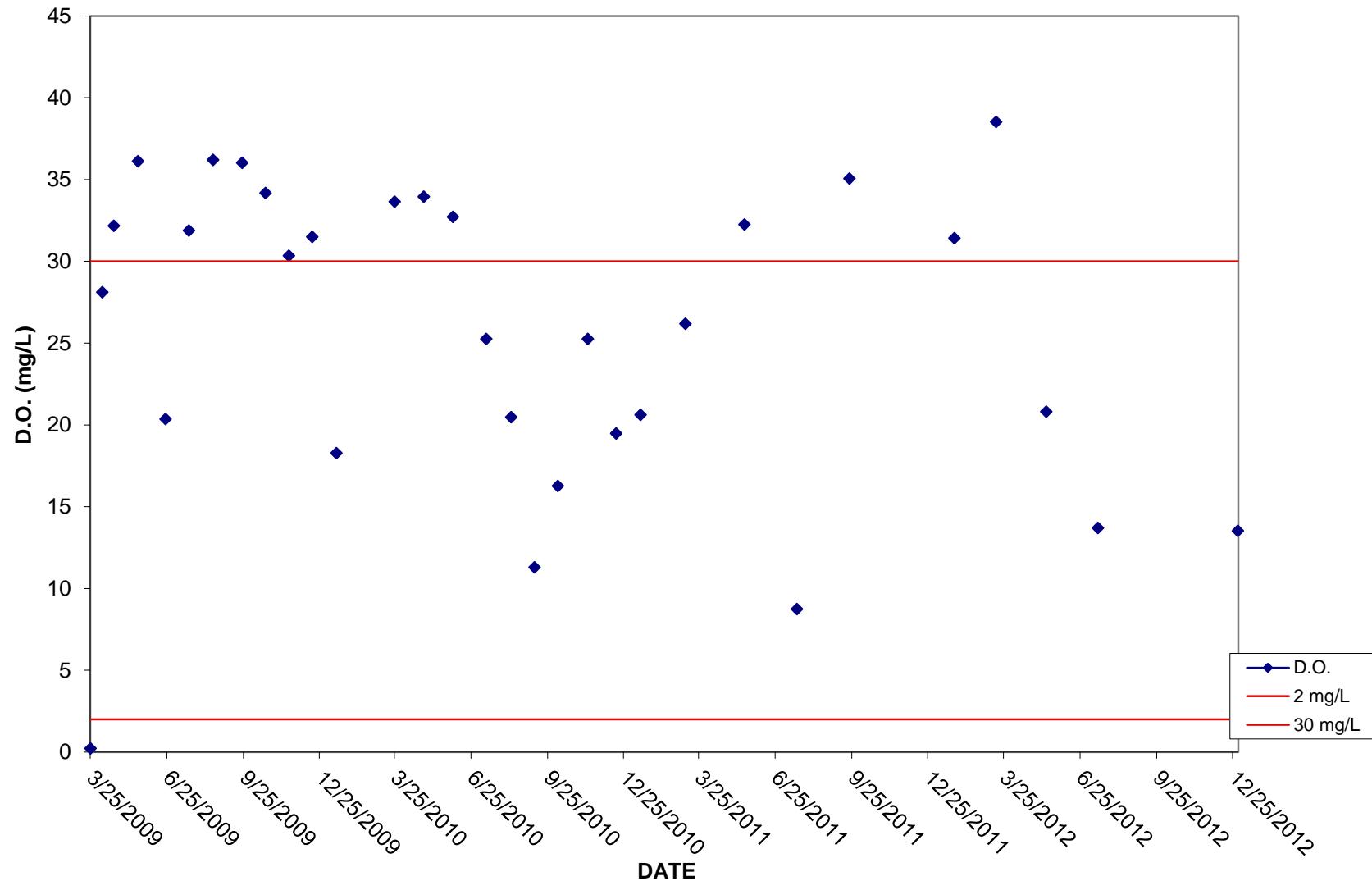
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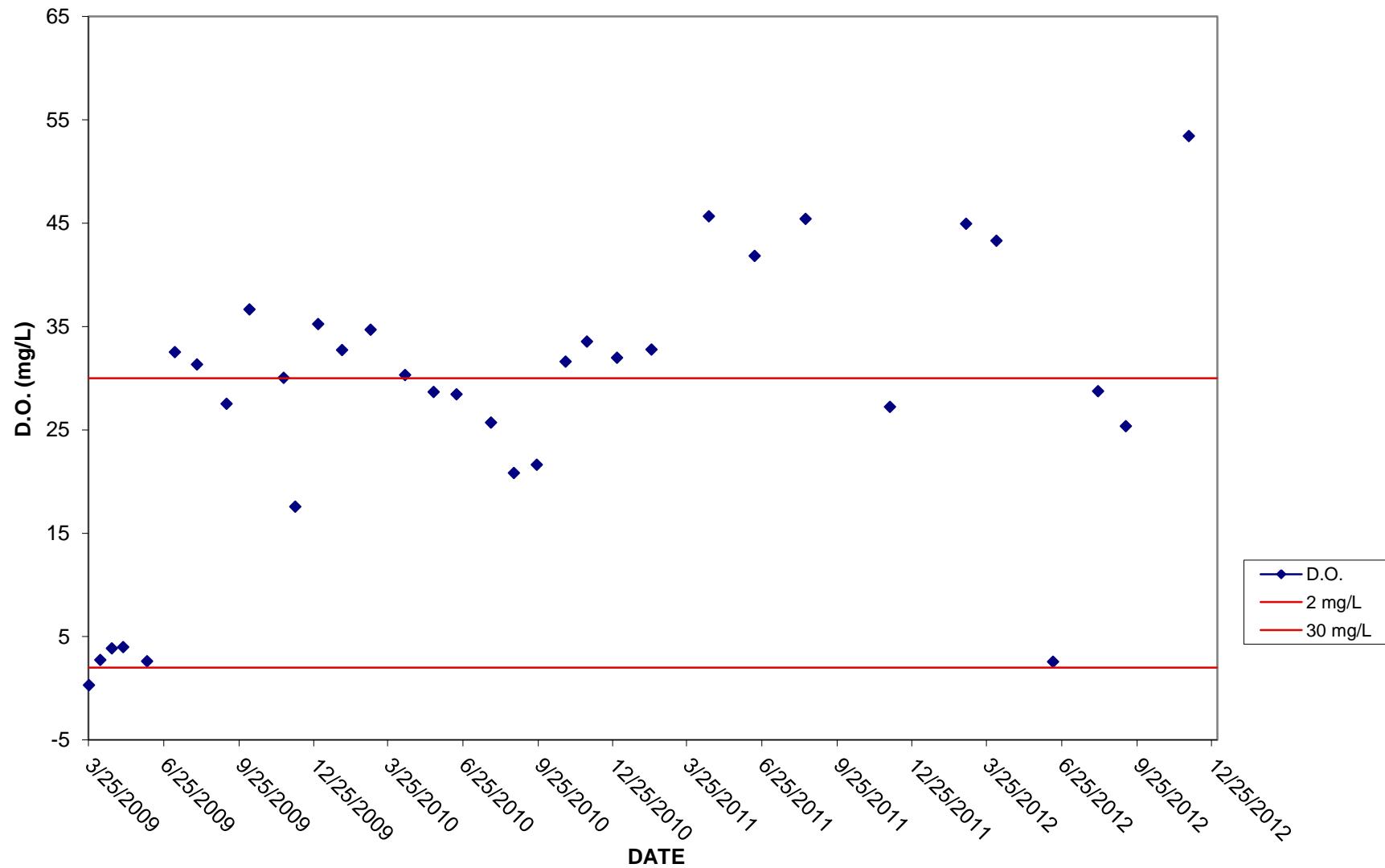
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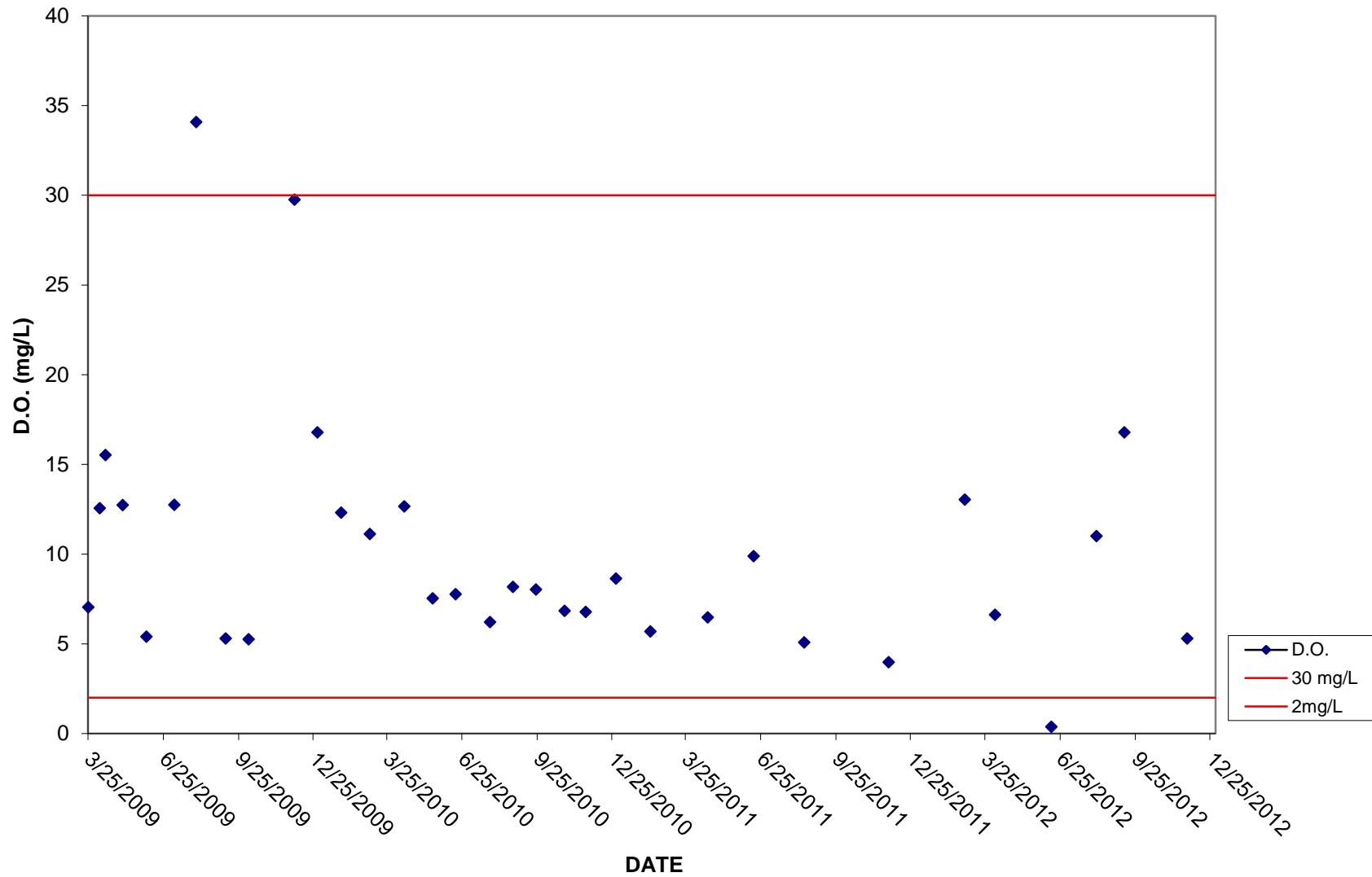
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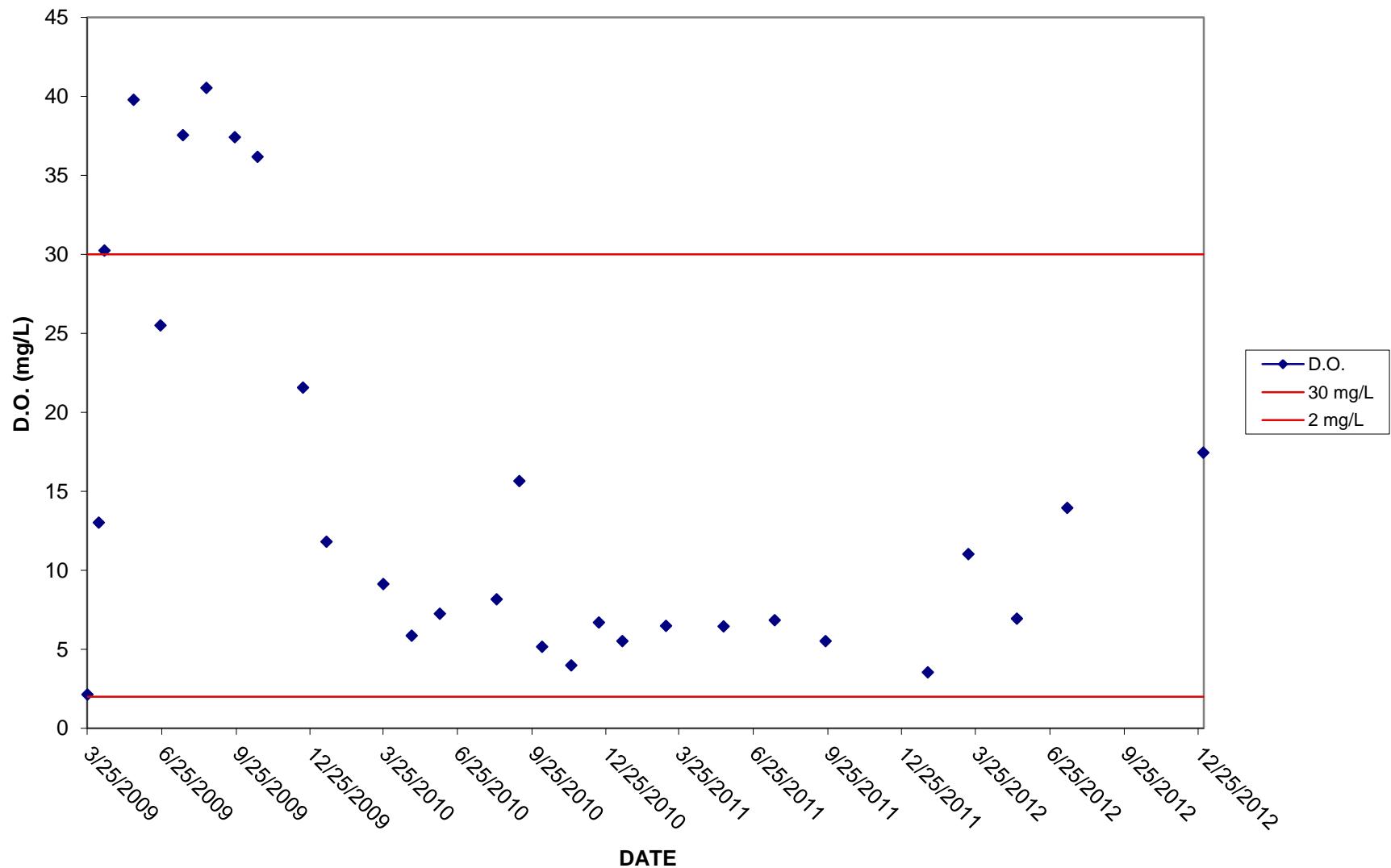
IW-27S D.O. FIELD DATA vs TIME



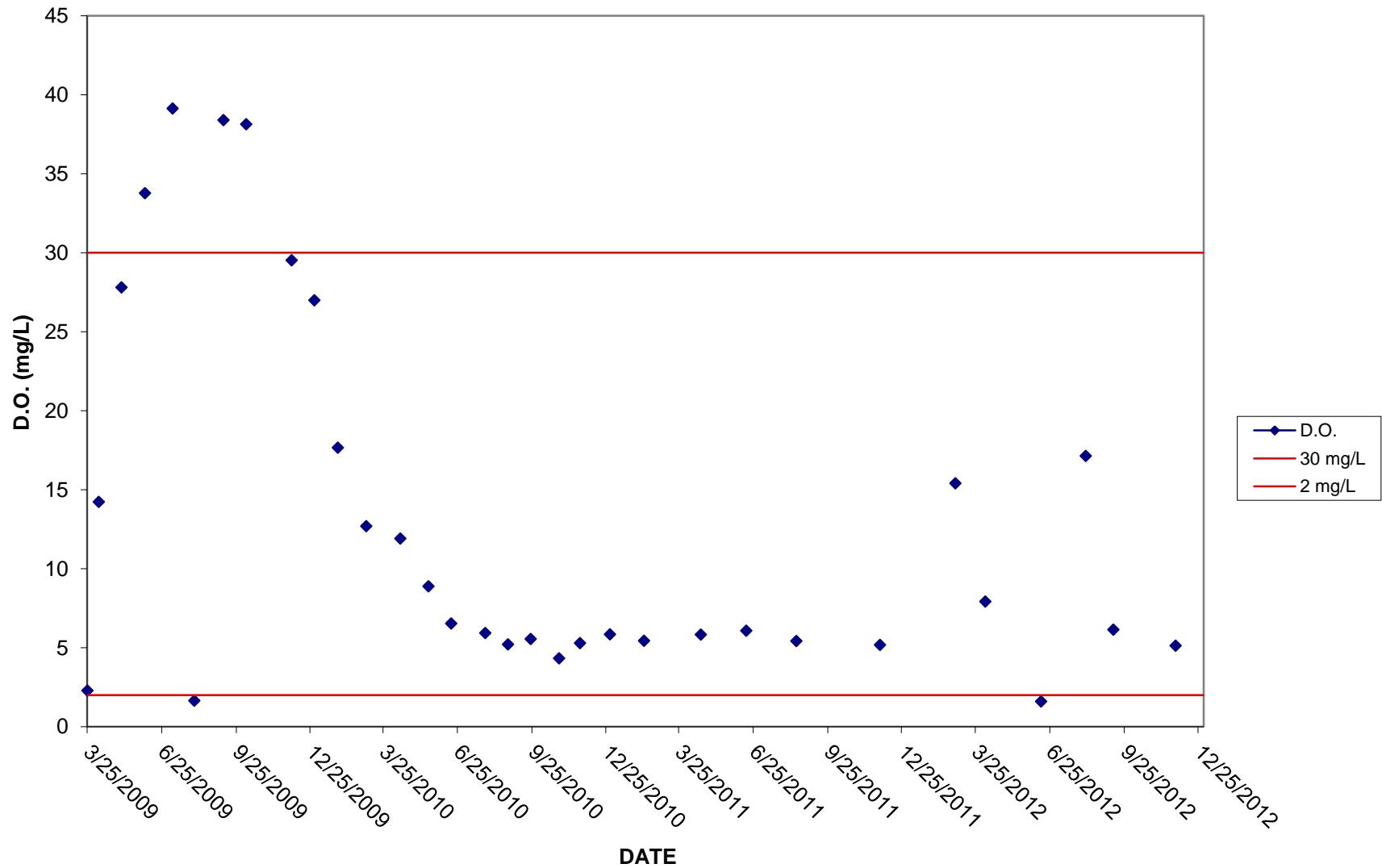
IW-1D D.O. FIELD DATA vs TIME



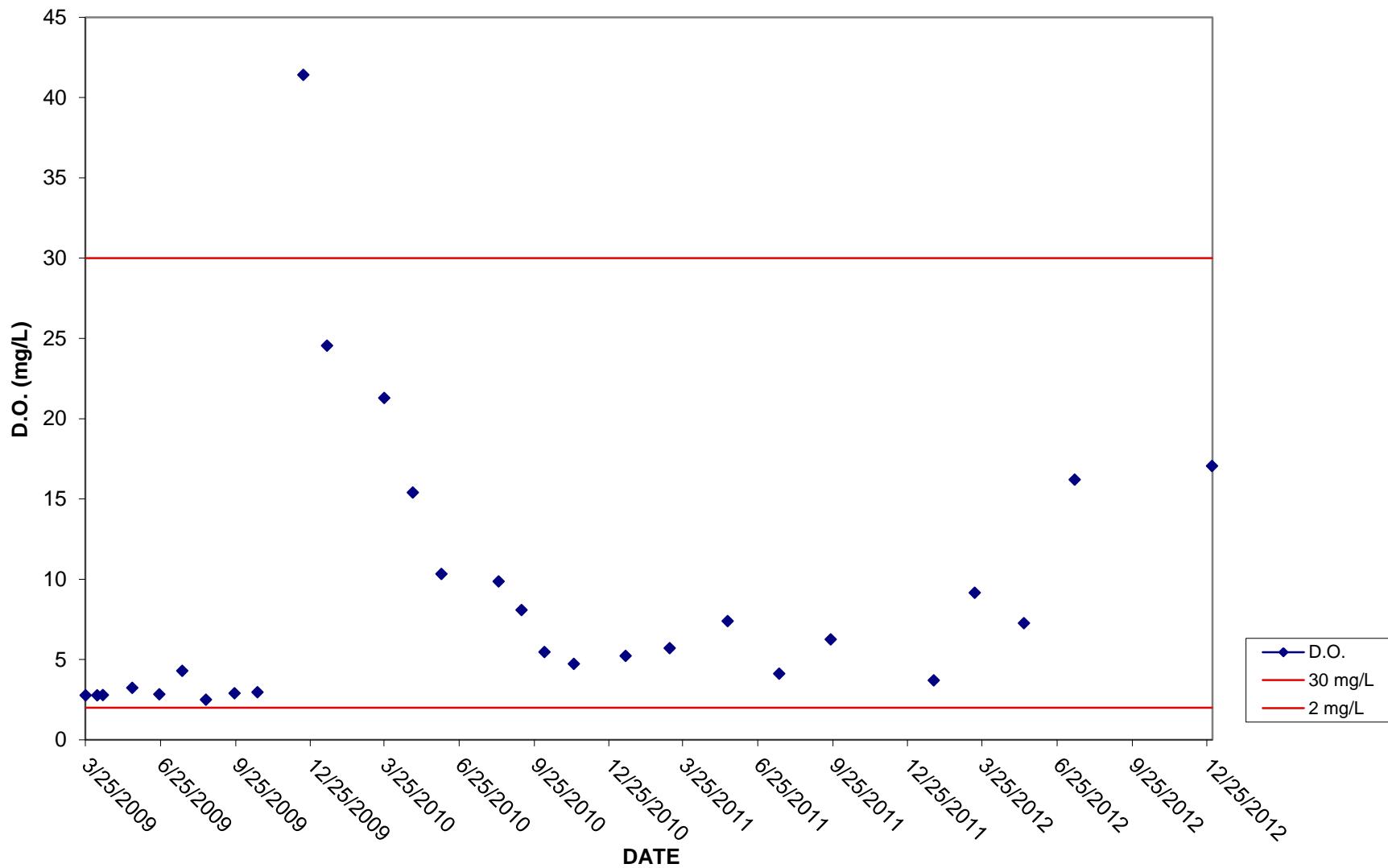
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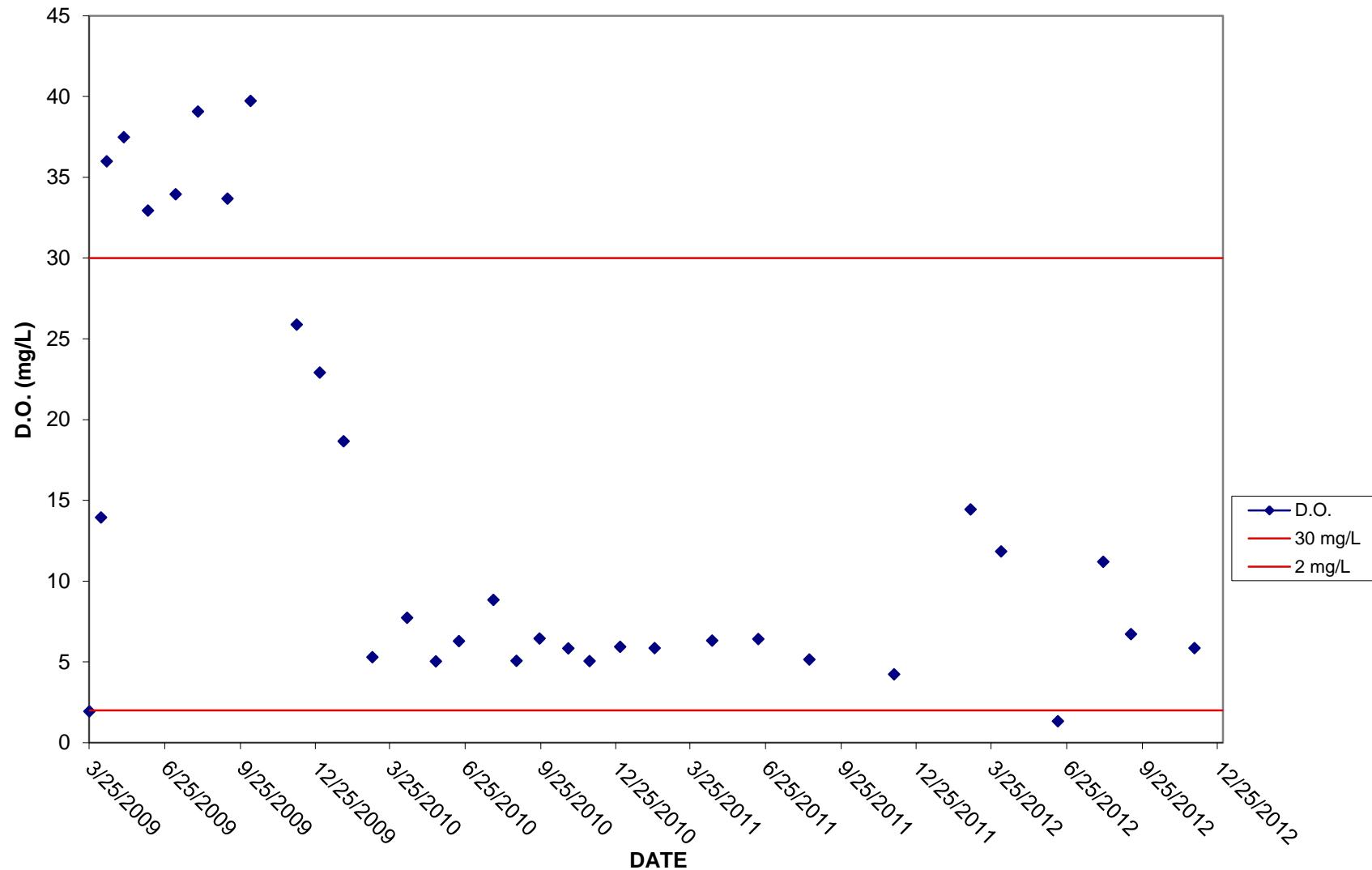
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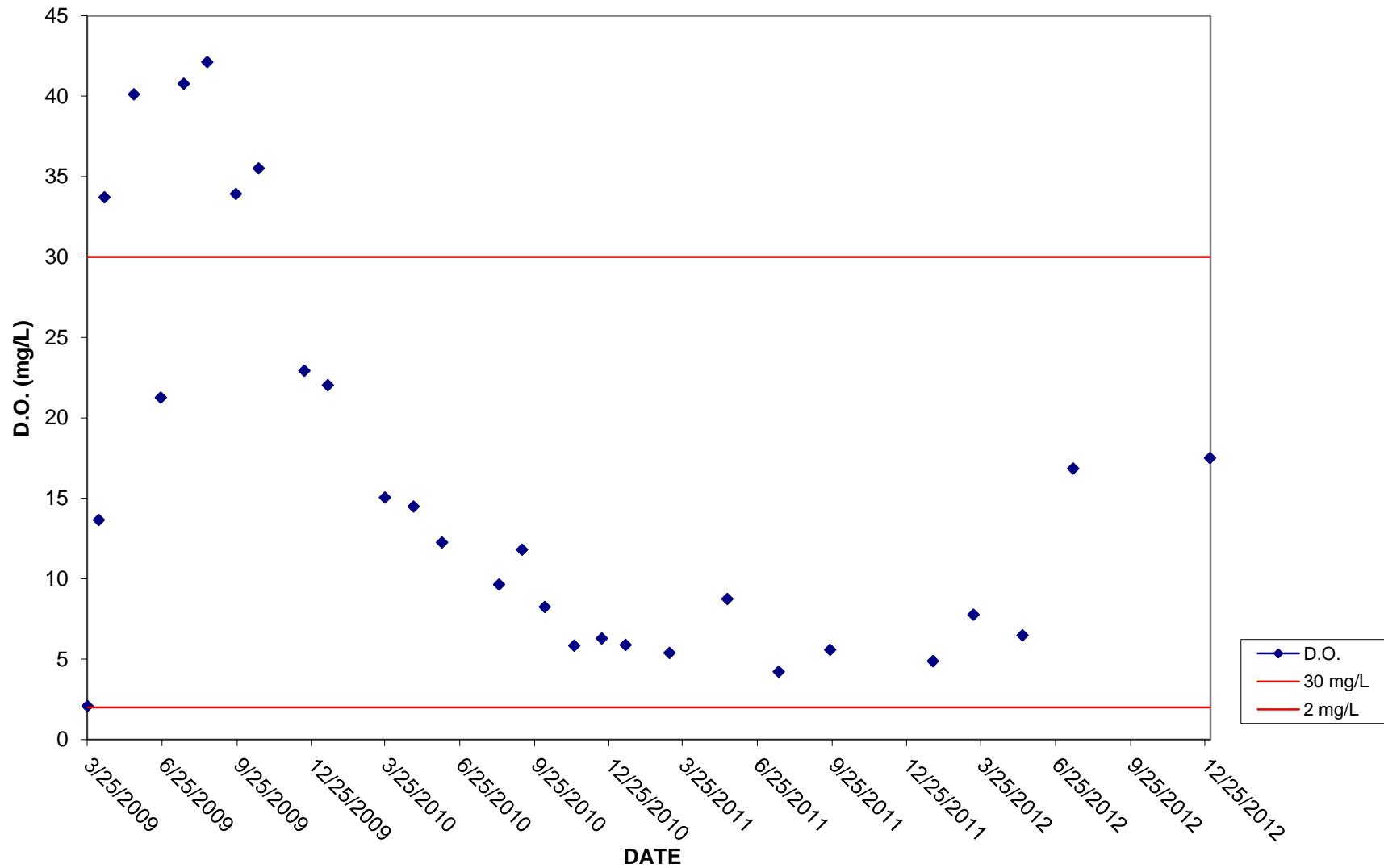
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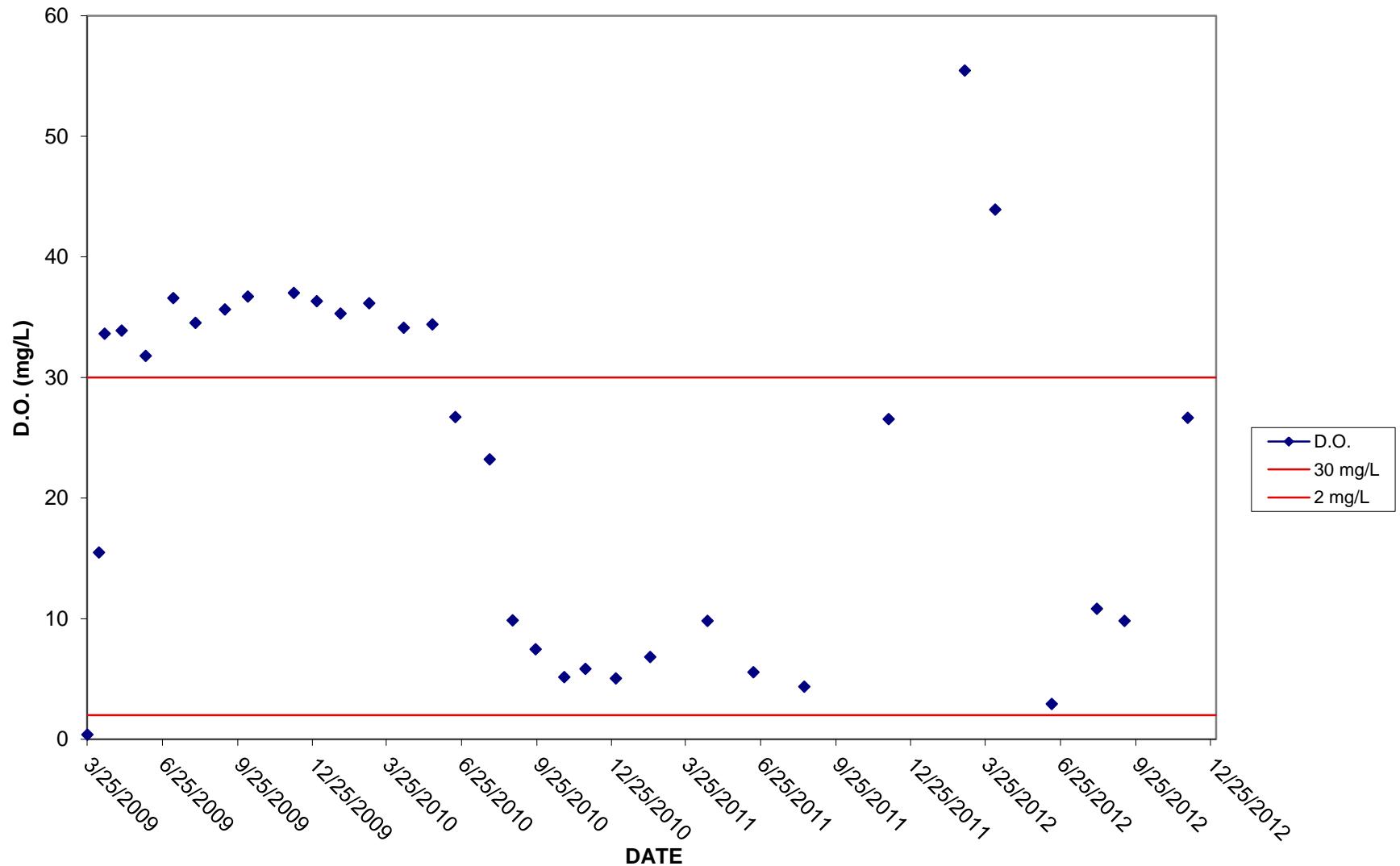
IW-5D D.O. vs TIME



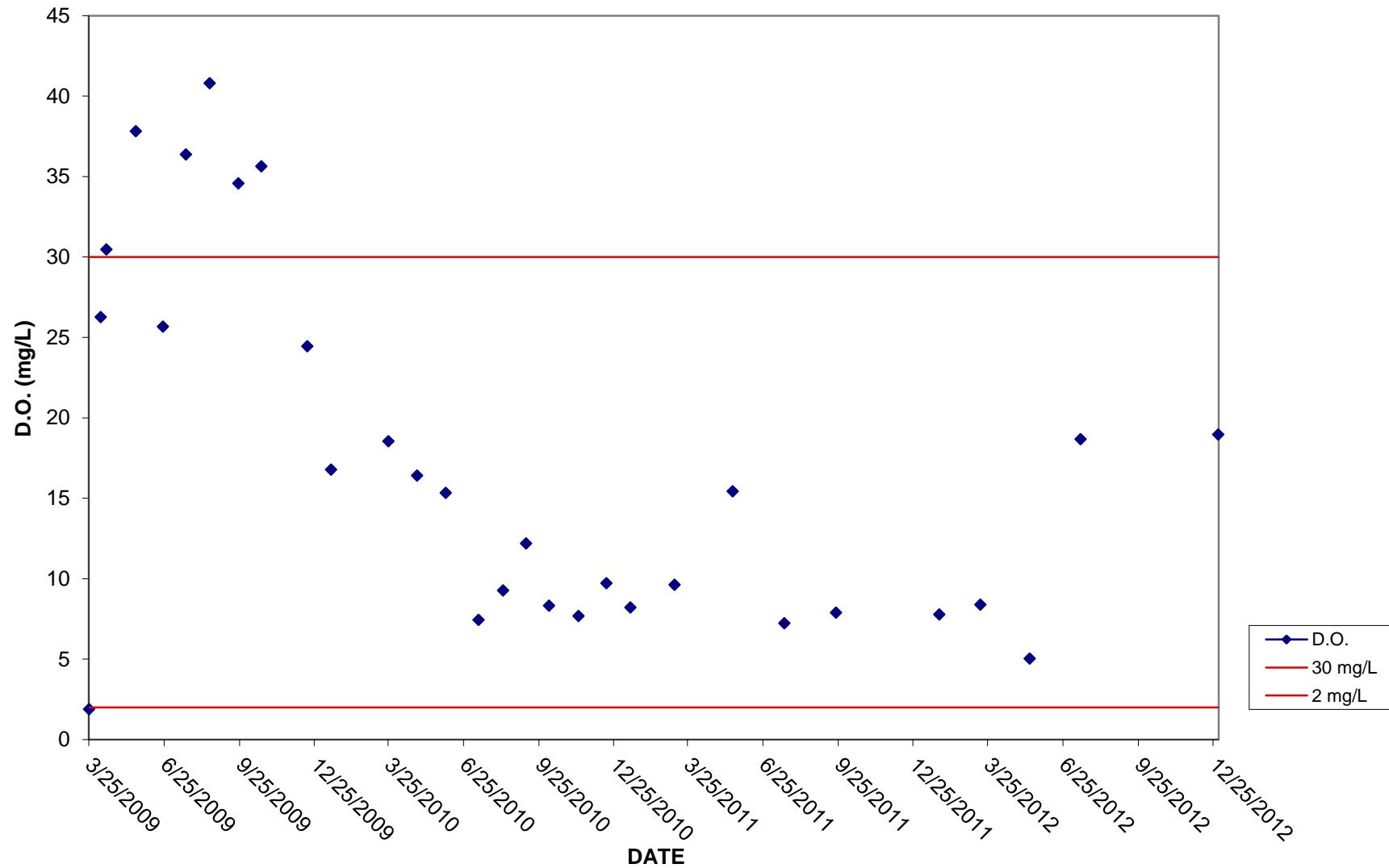
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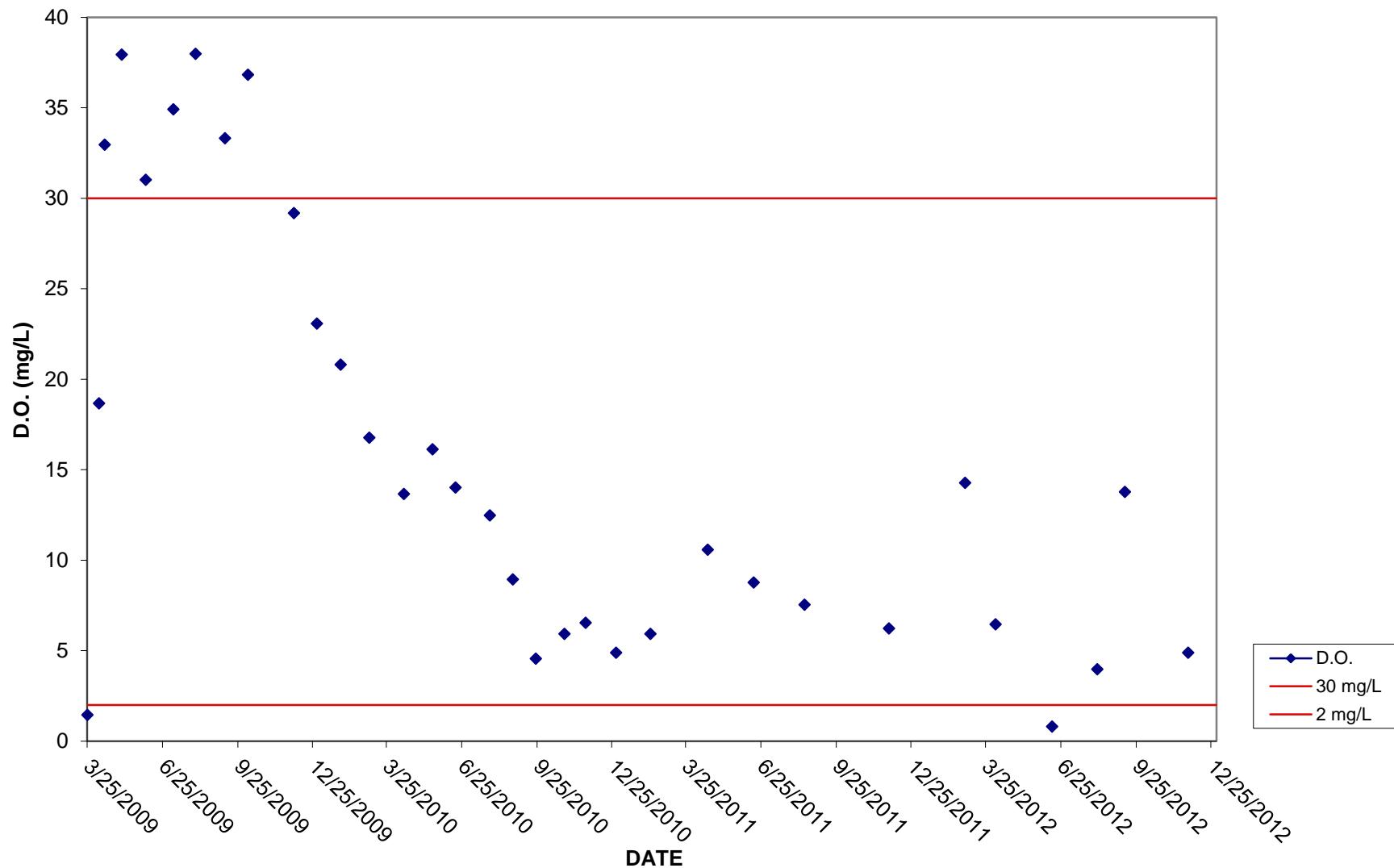
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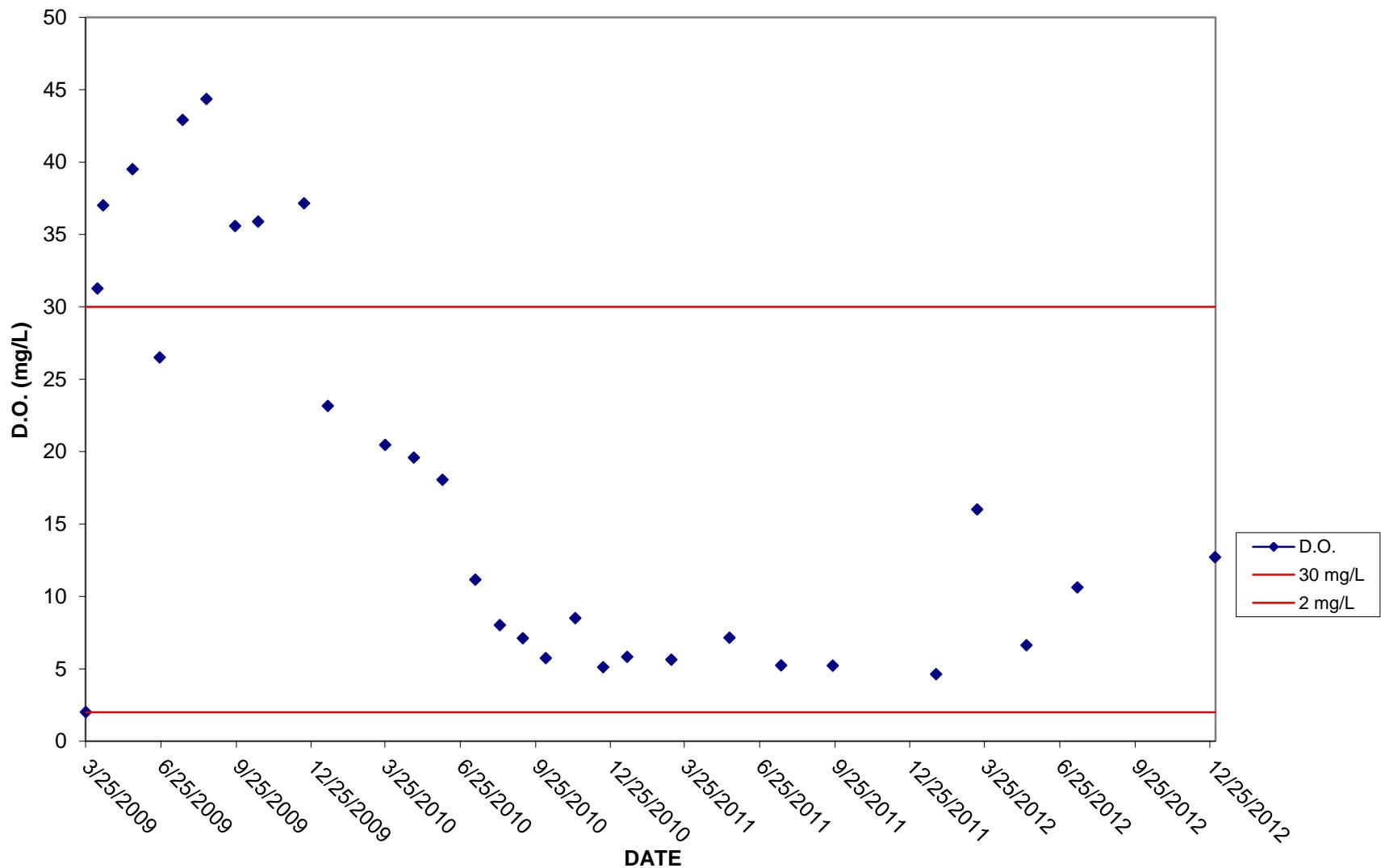
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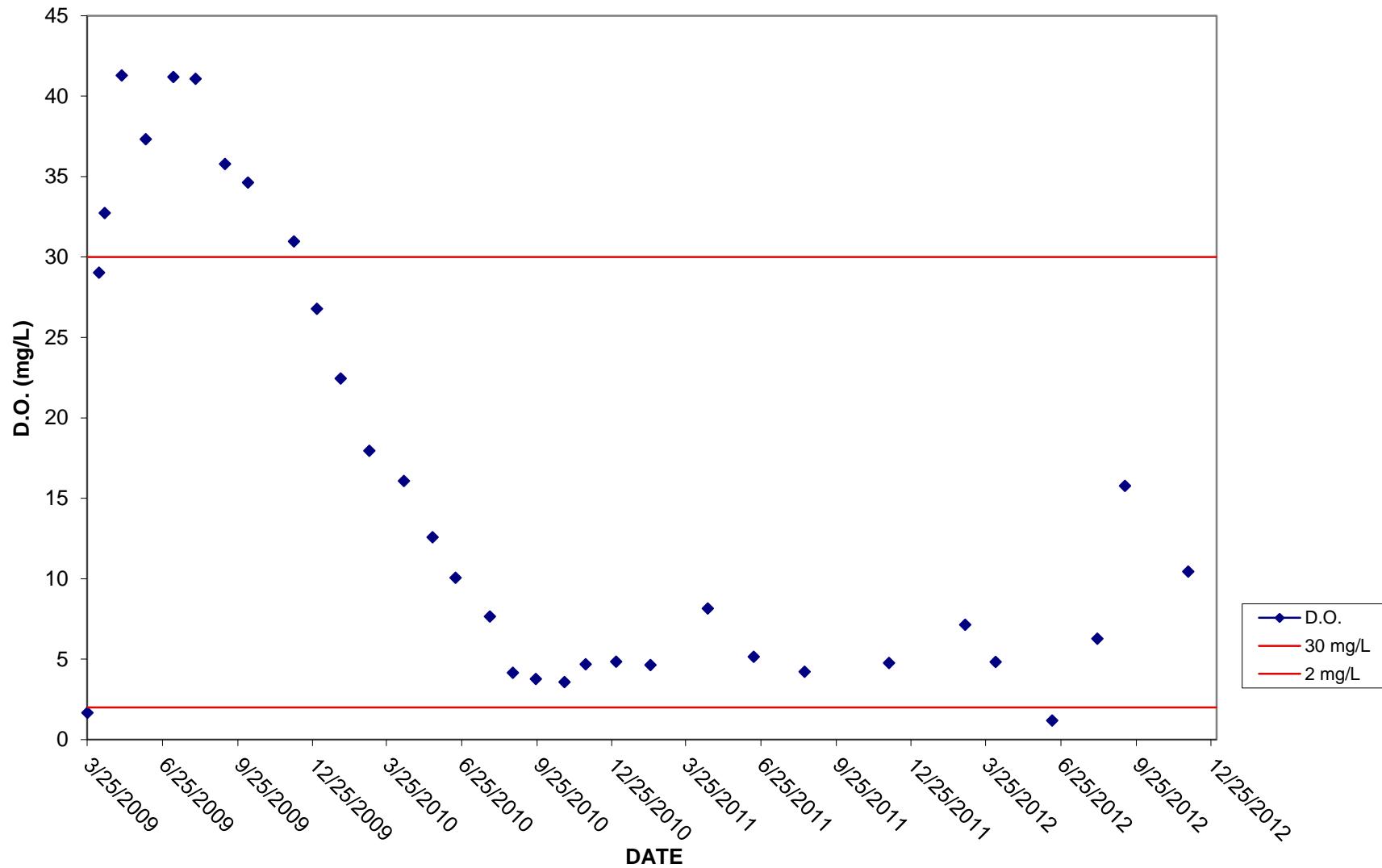
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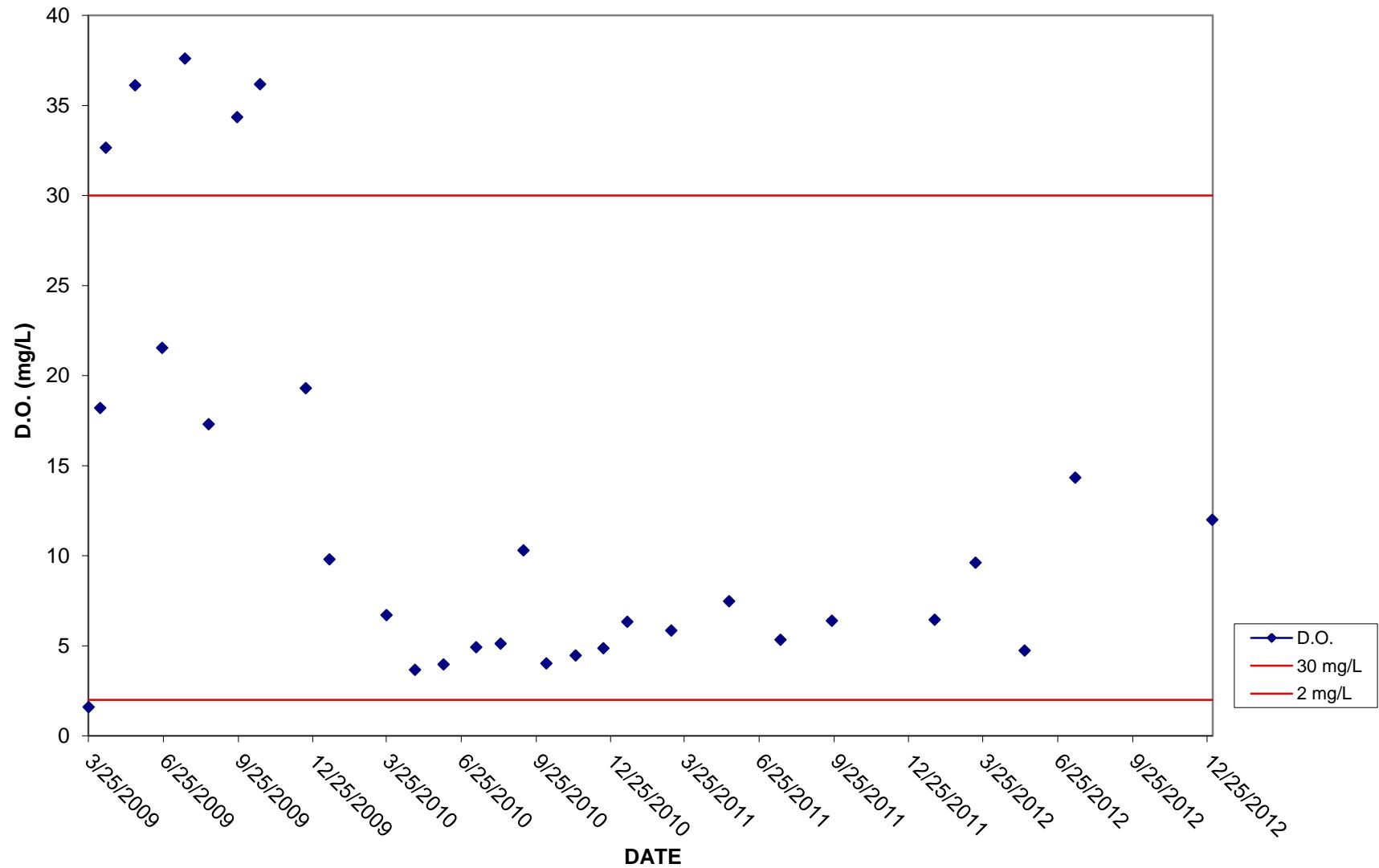
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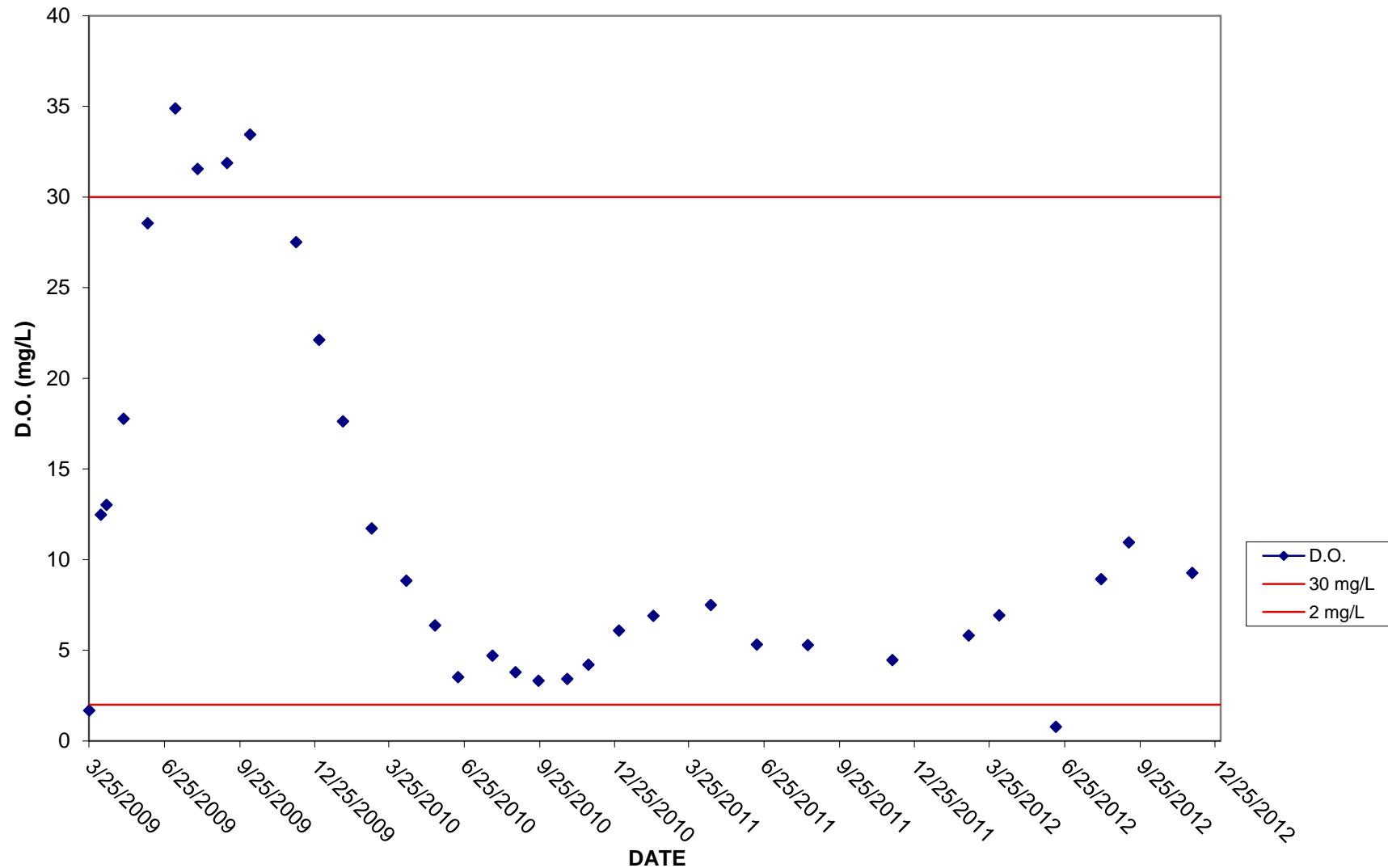
IW-11D D.O. FIELD DATA vs TIME



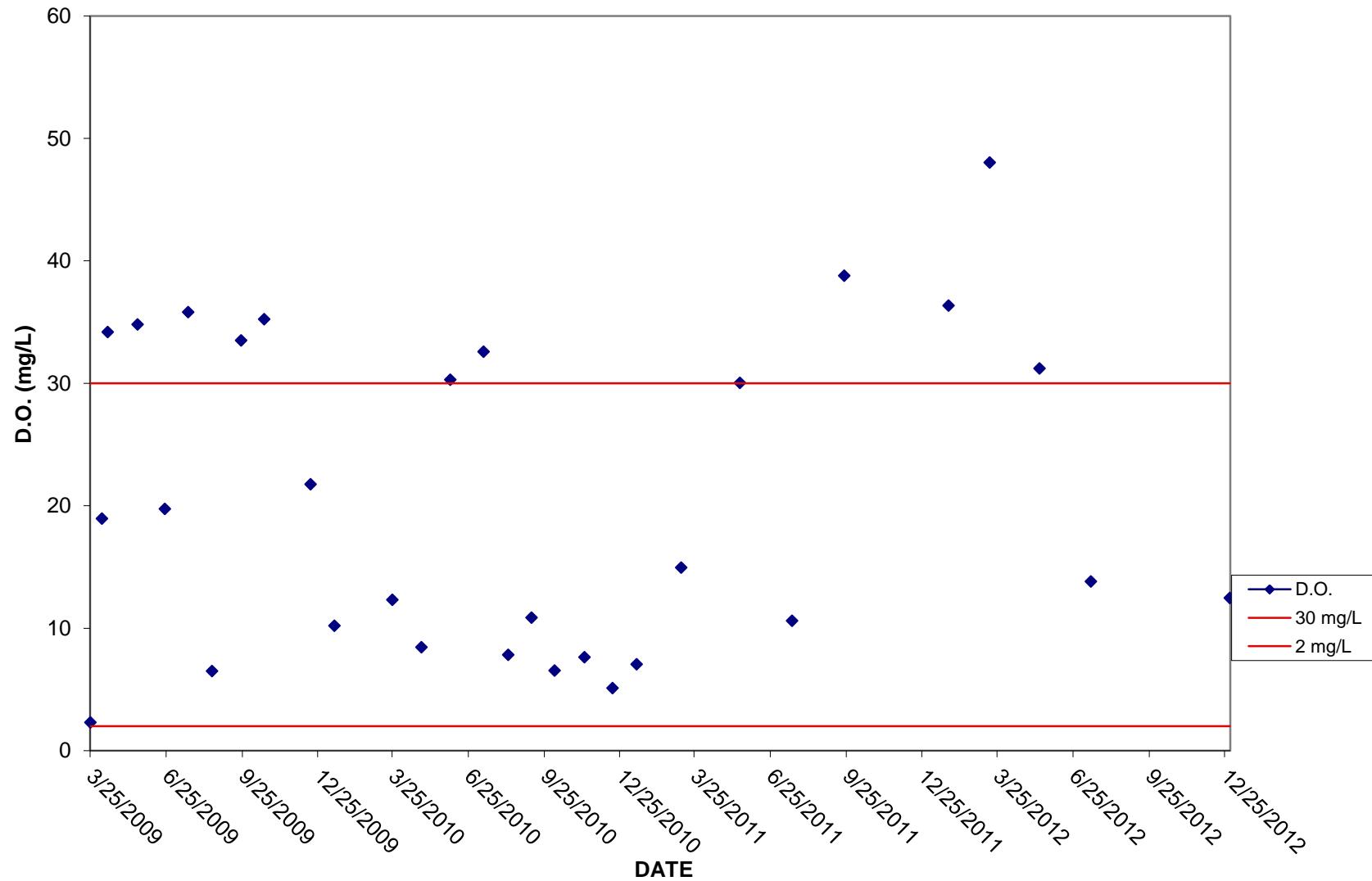
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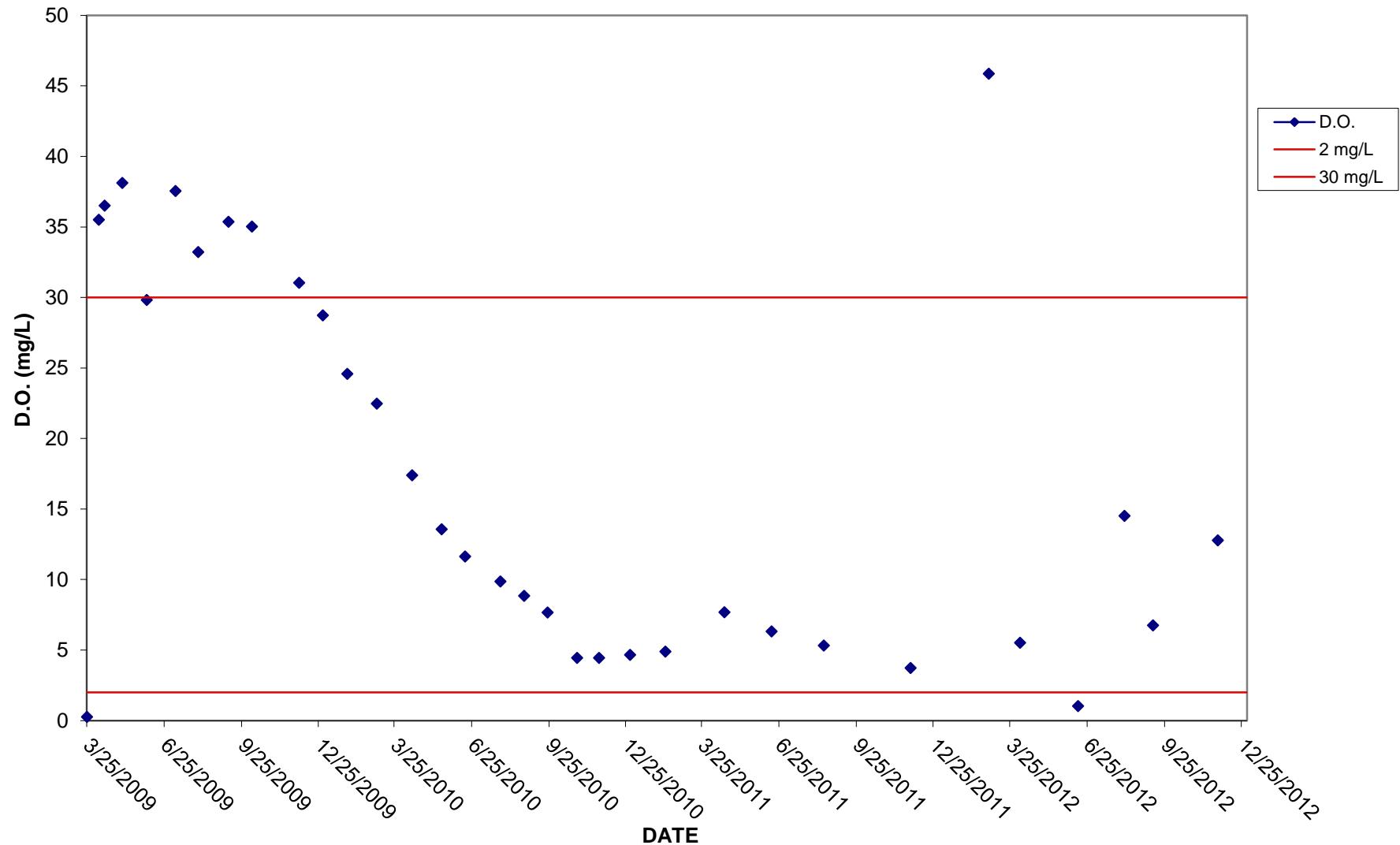
IW-13D D.O. FIELD DATA vs TIME



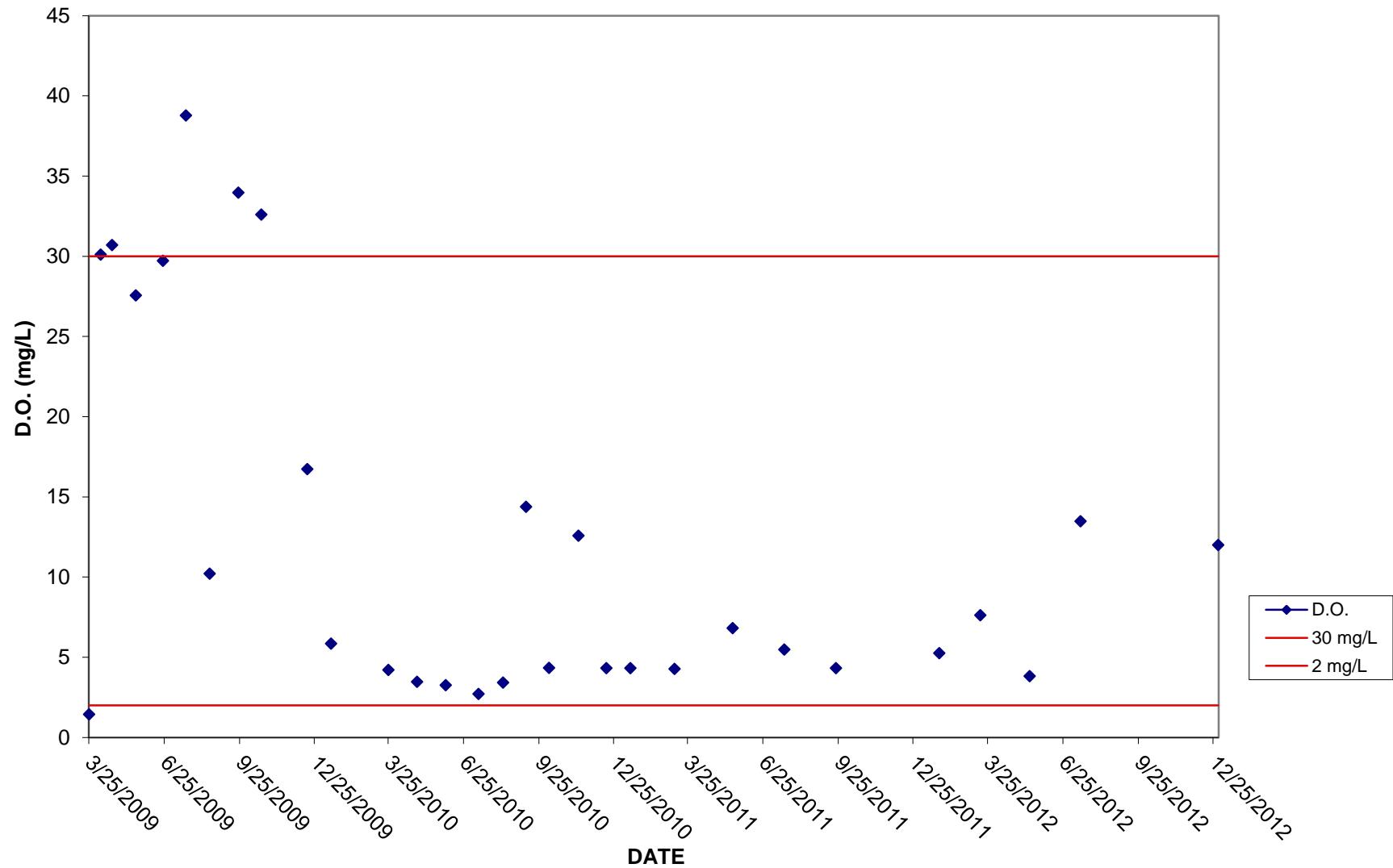
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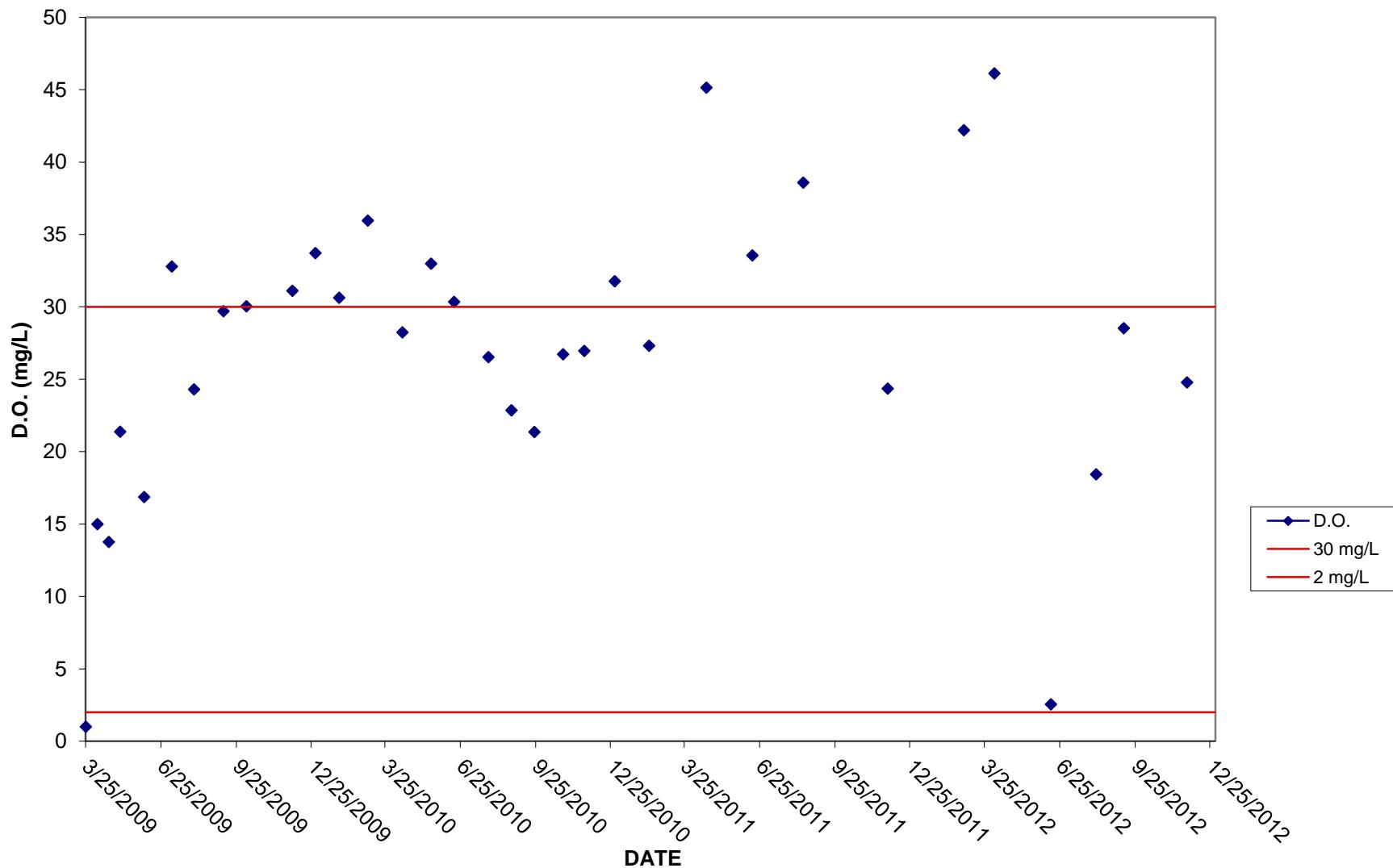
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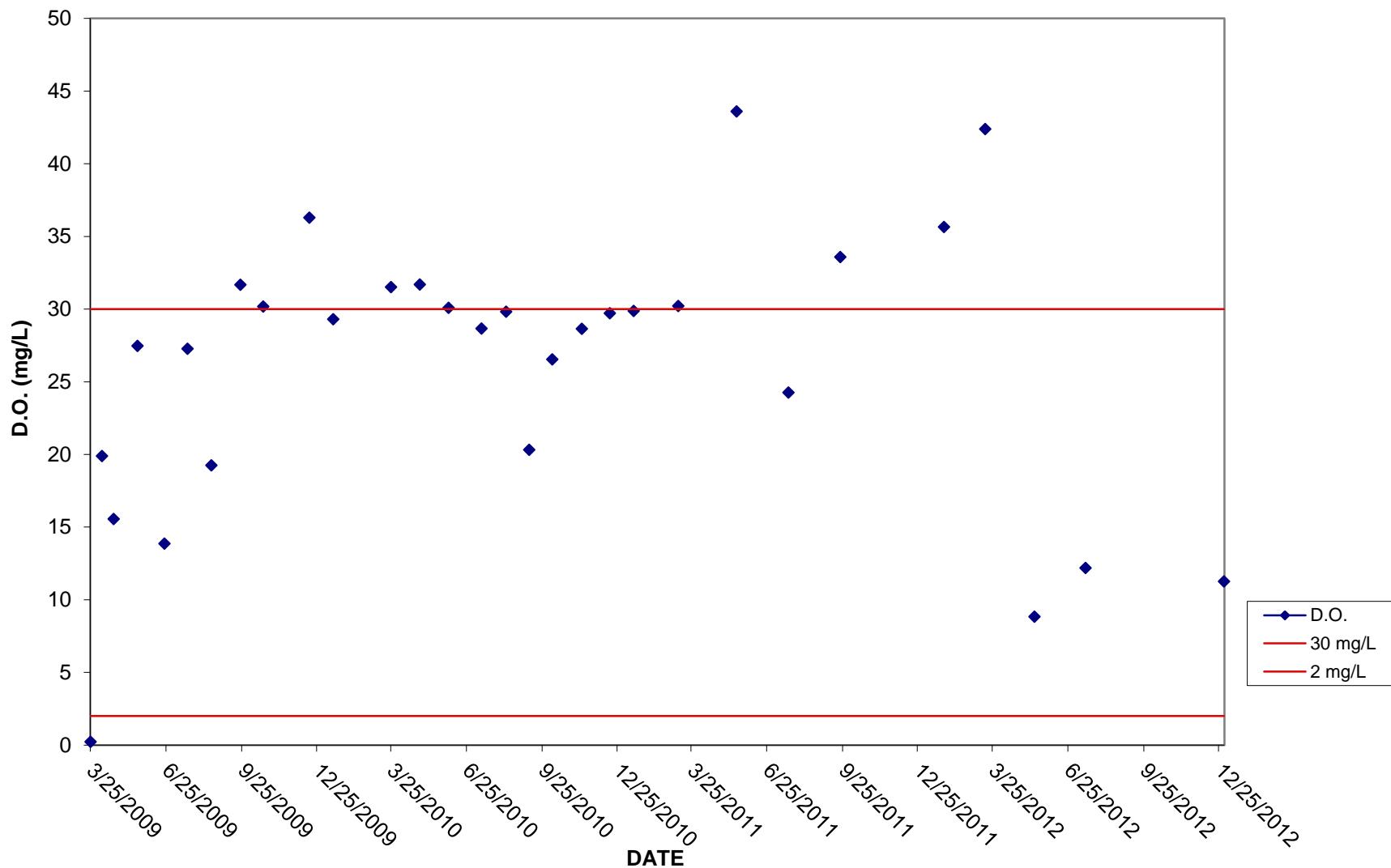
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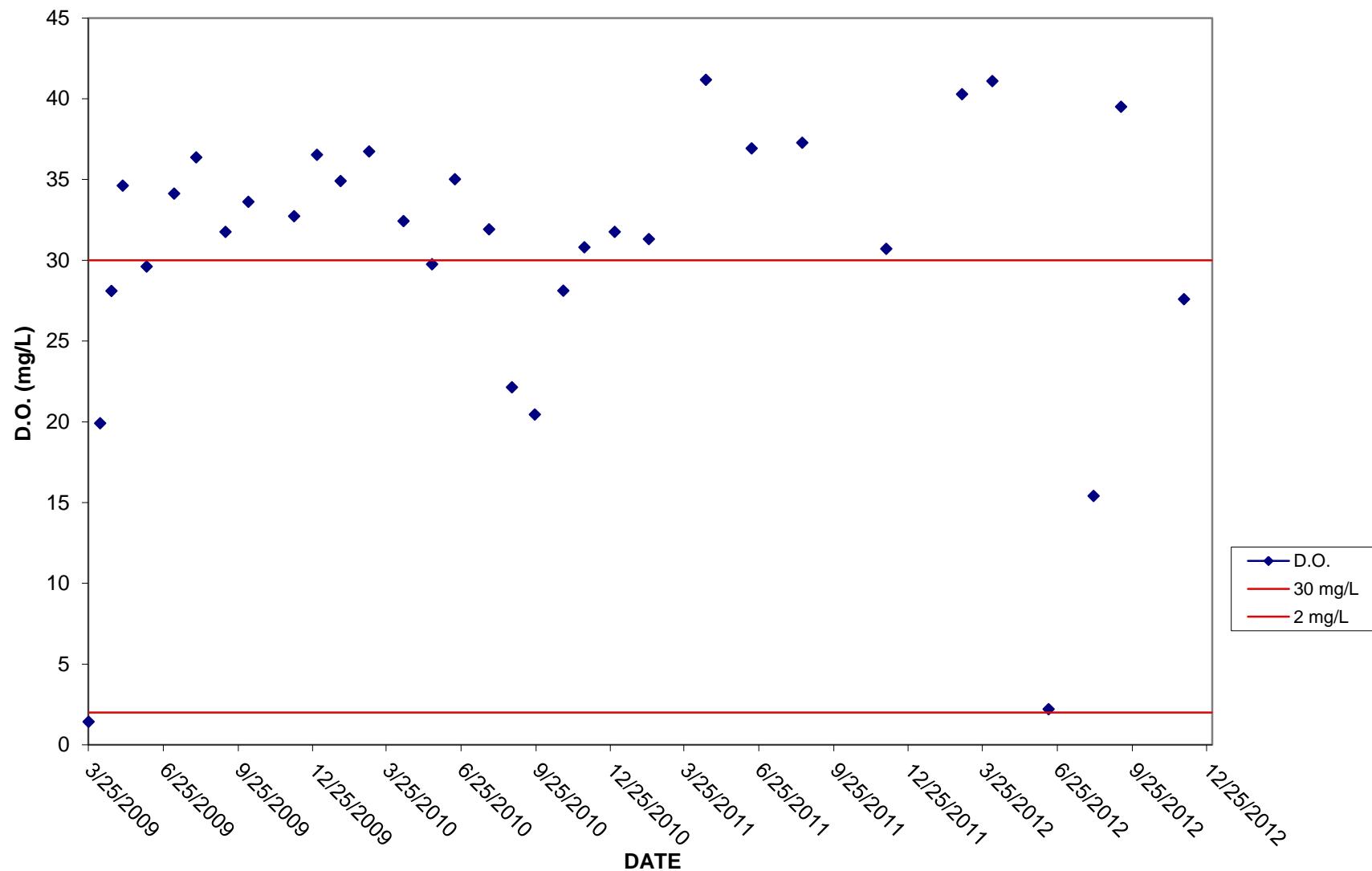
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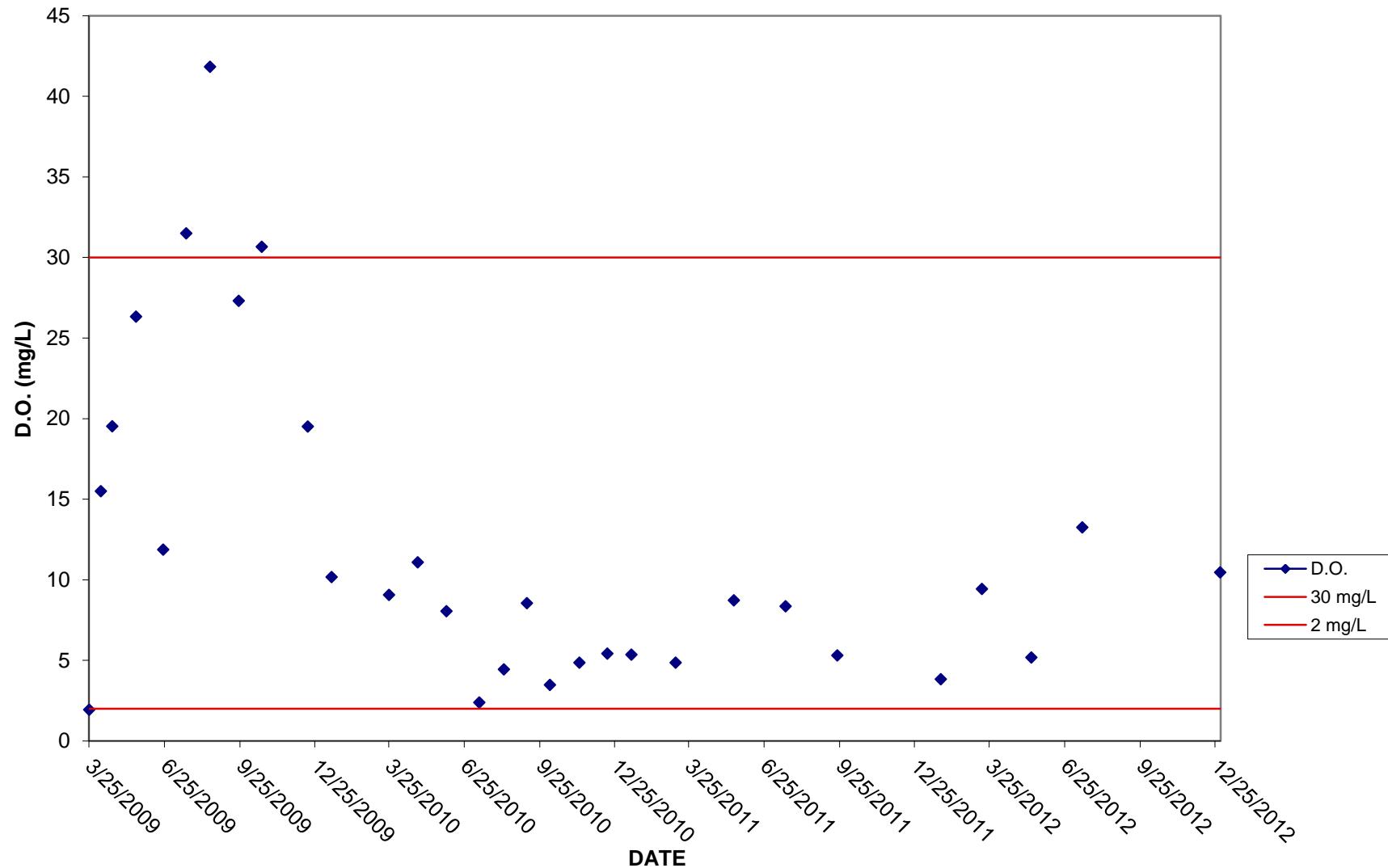
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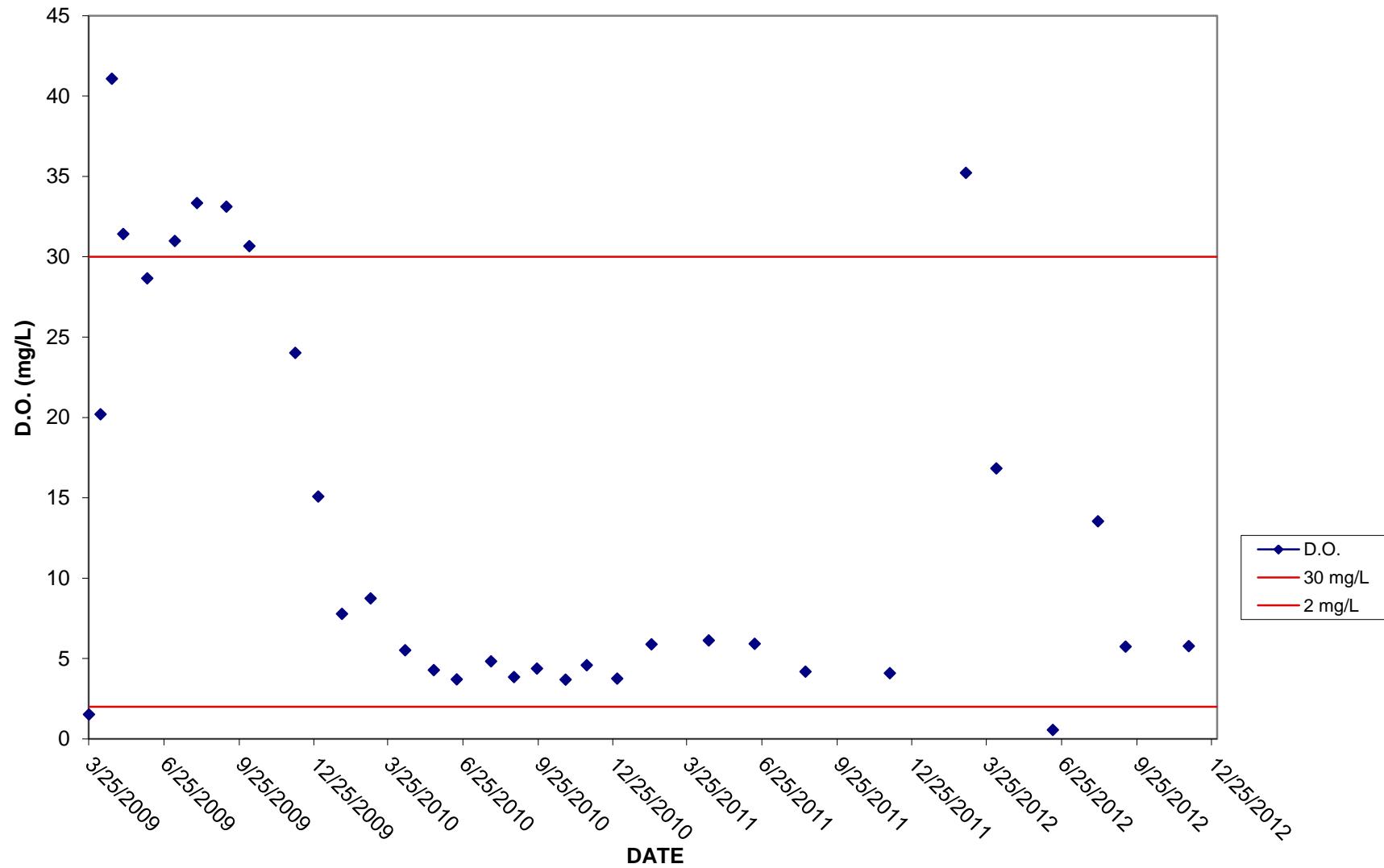
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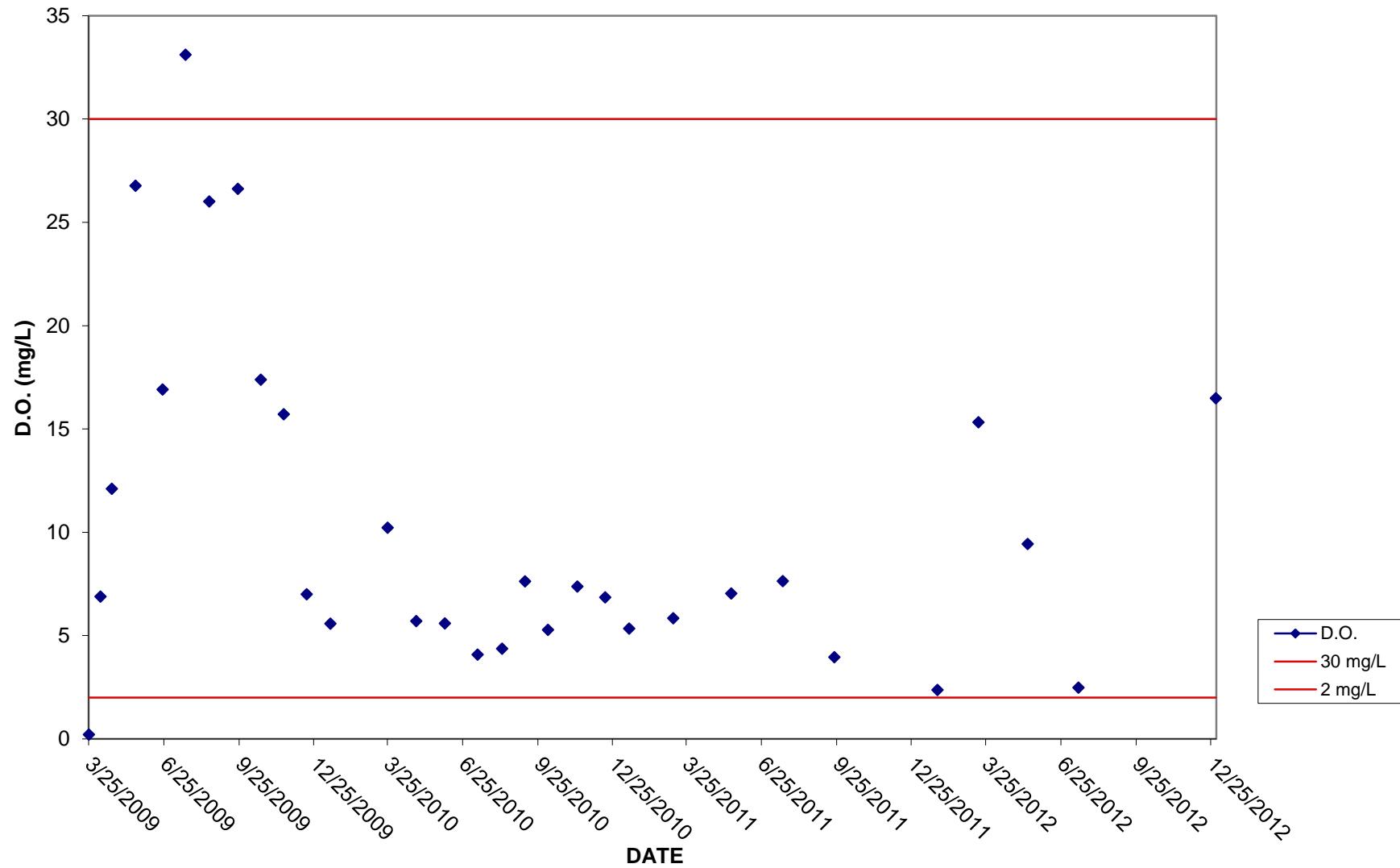
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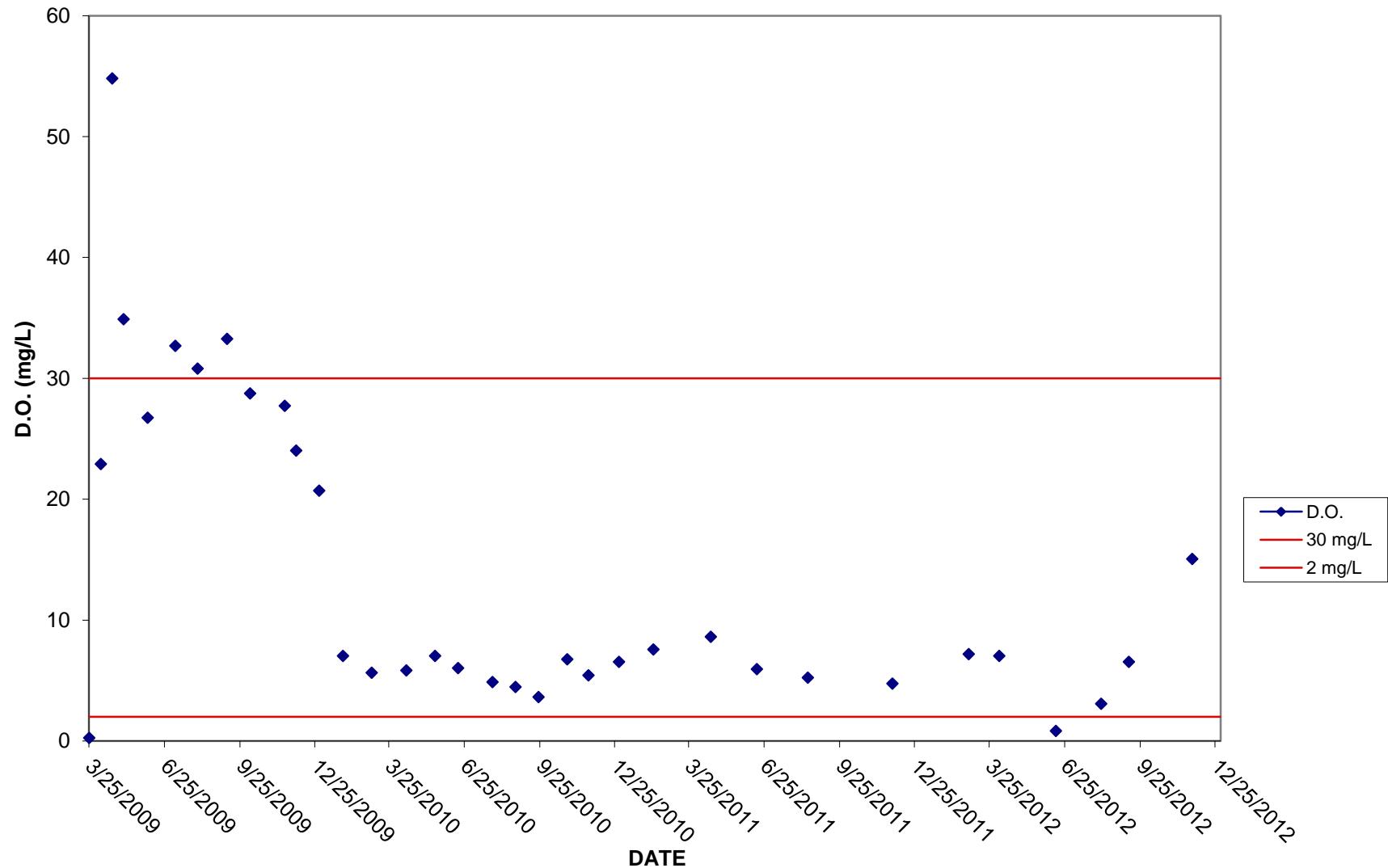
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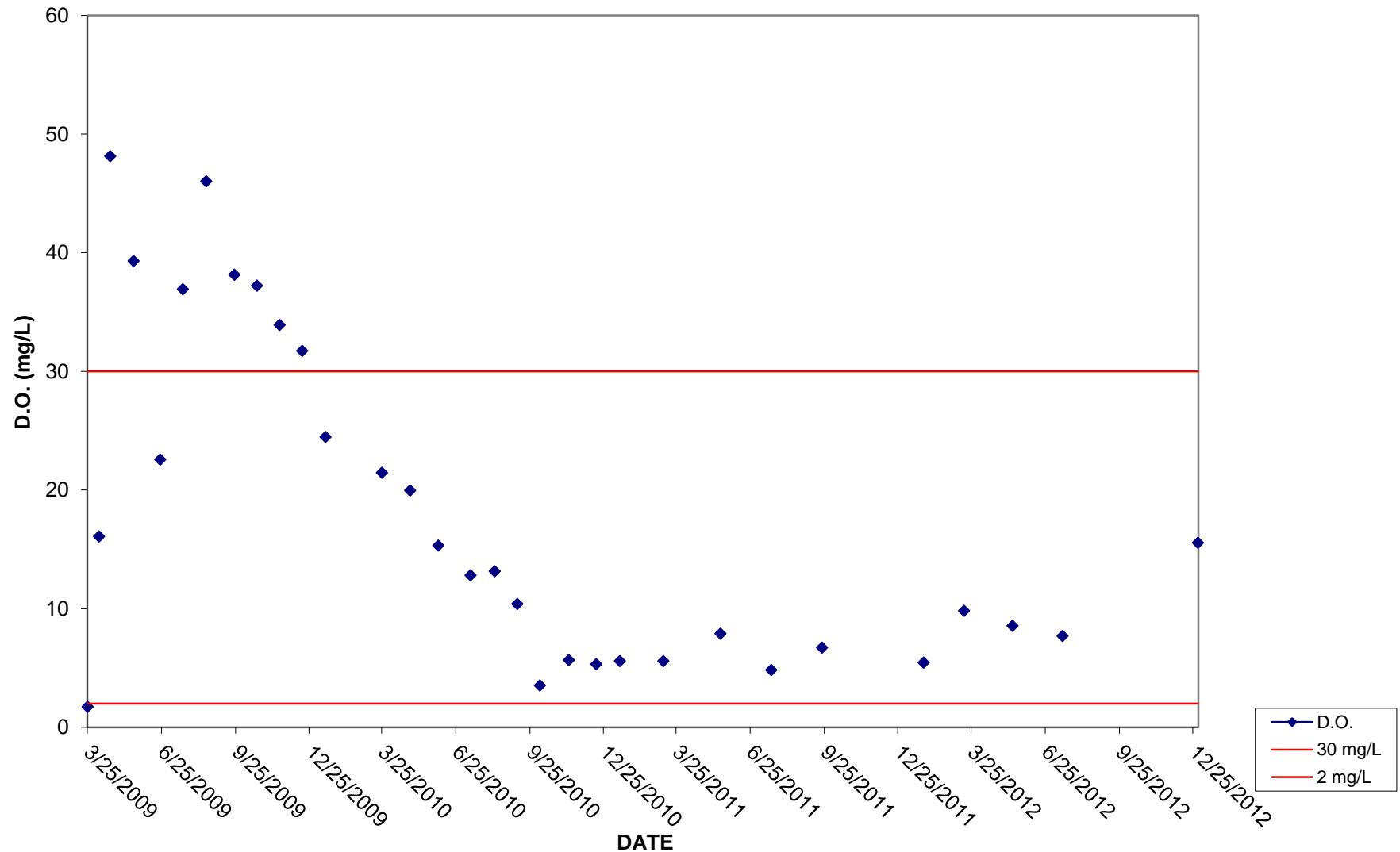
IW-22D D.O. FIELD DATA vs TIME



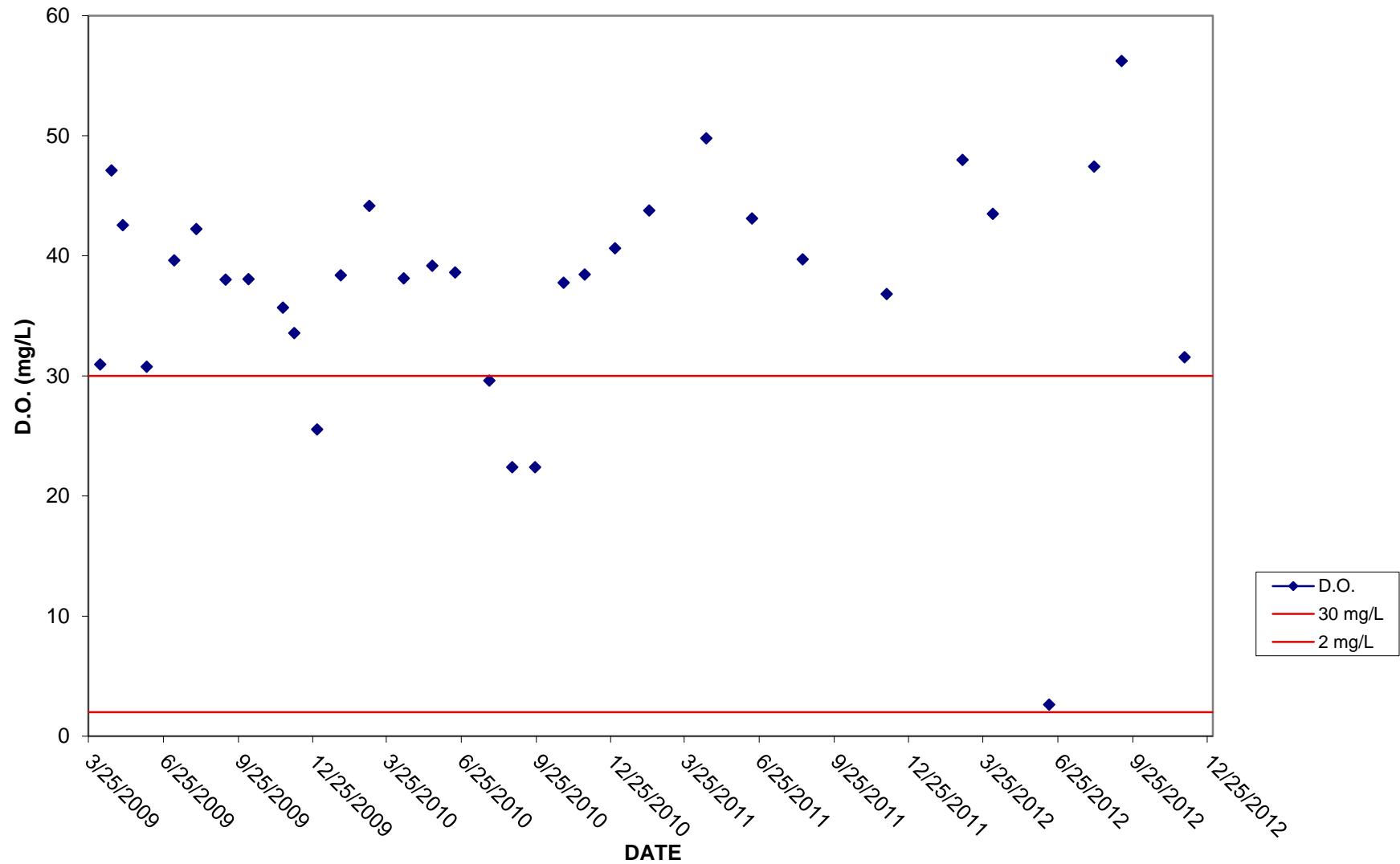
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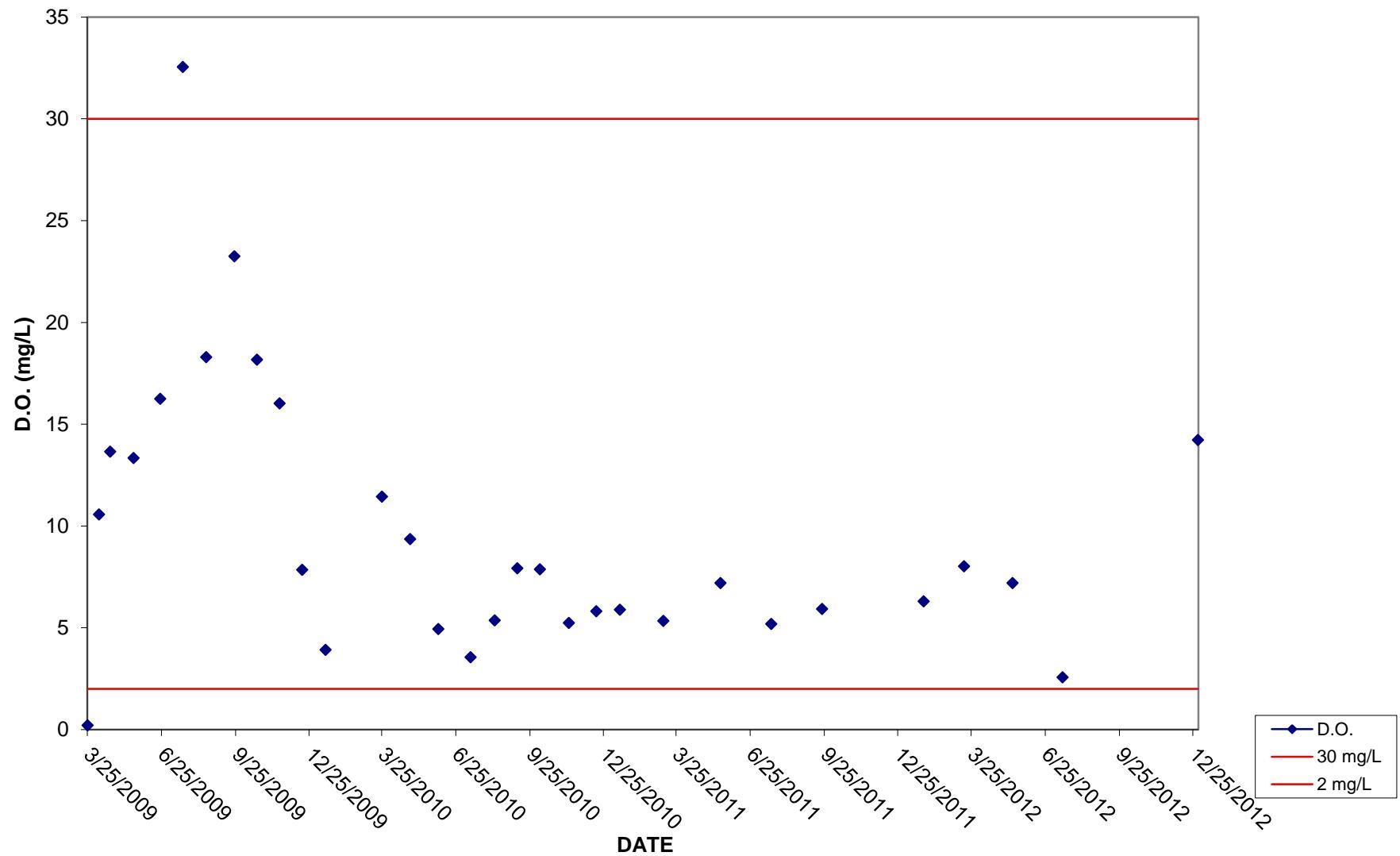
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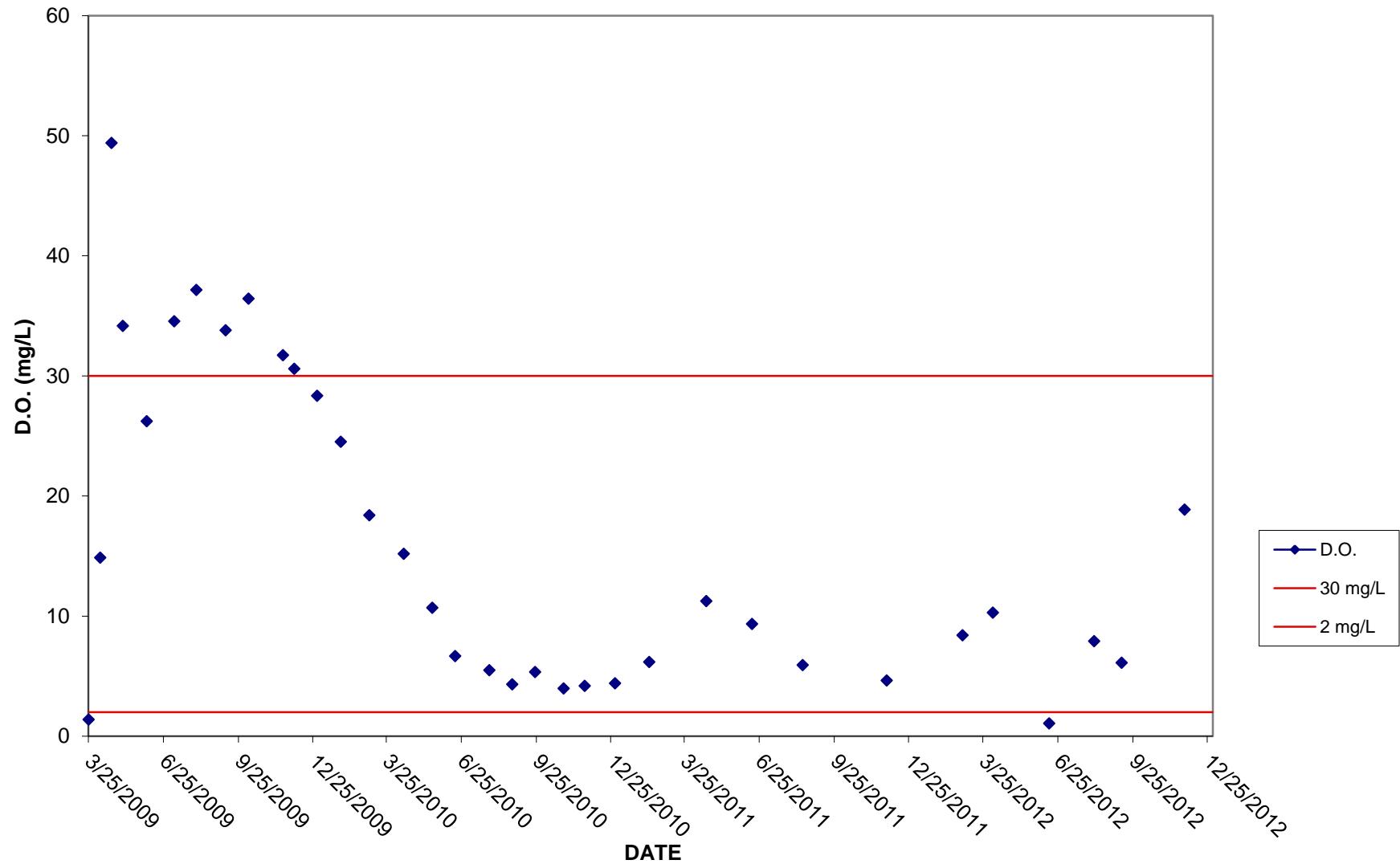
IW-25D D.O. FIELD DATA vs TIME



IW-26D D.O. FIELD DATA vs TIME



IW-27D D.O. FIELD DATA vs TIME

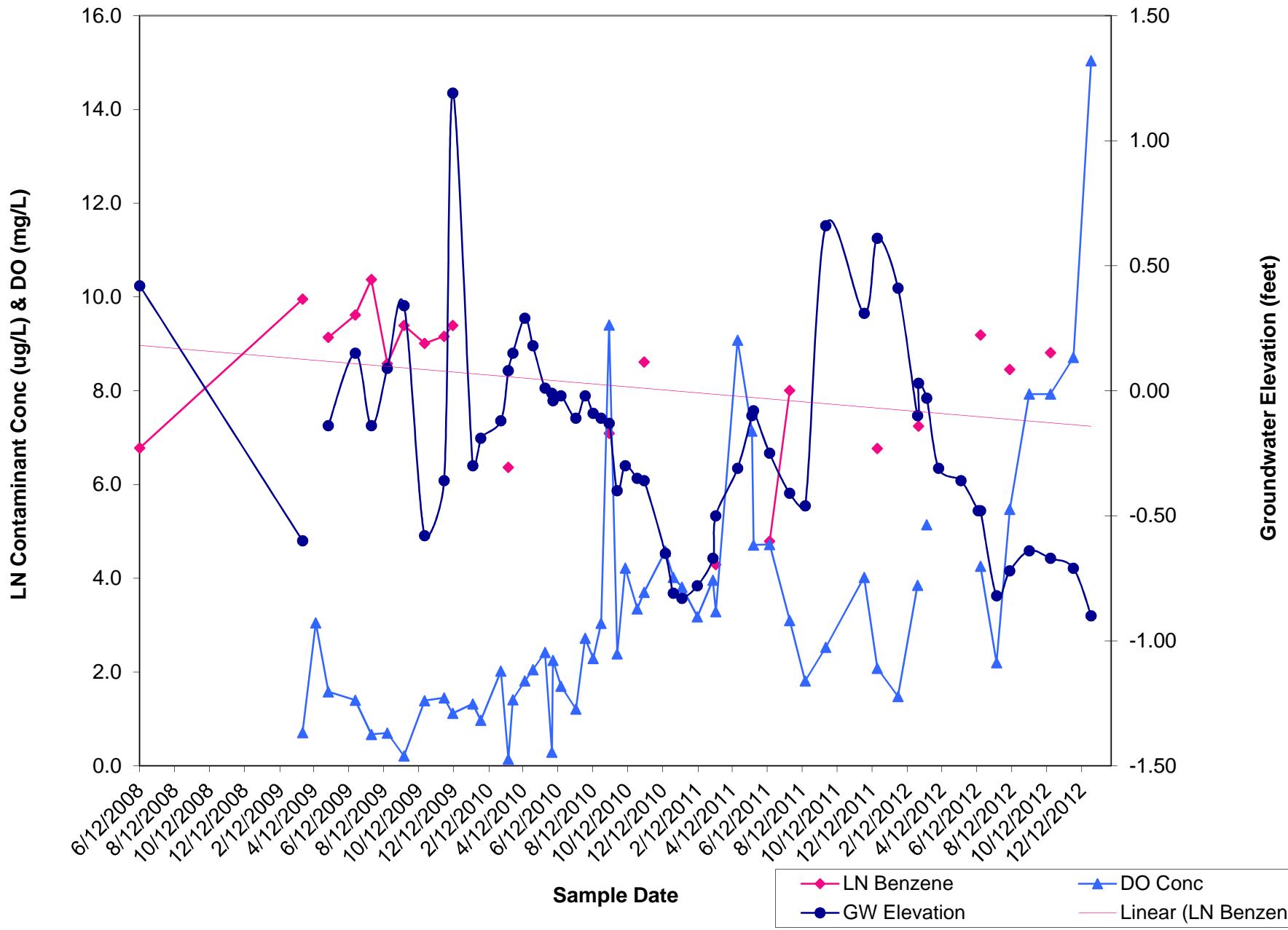




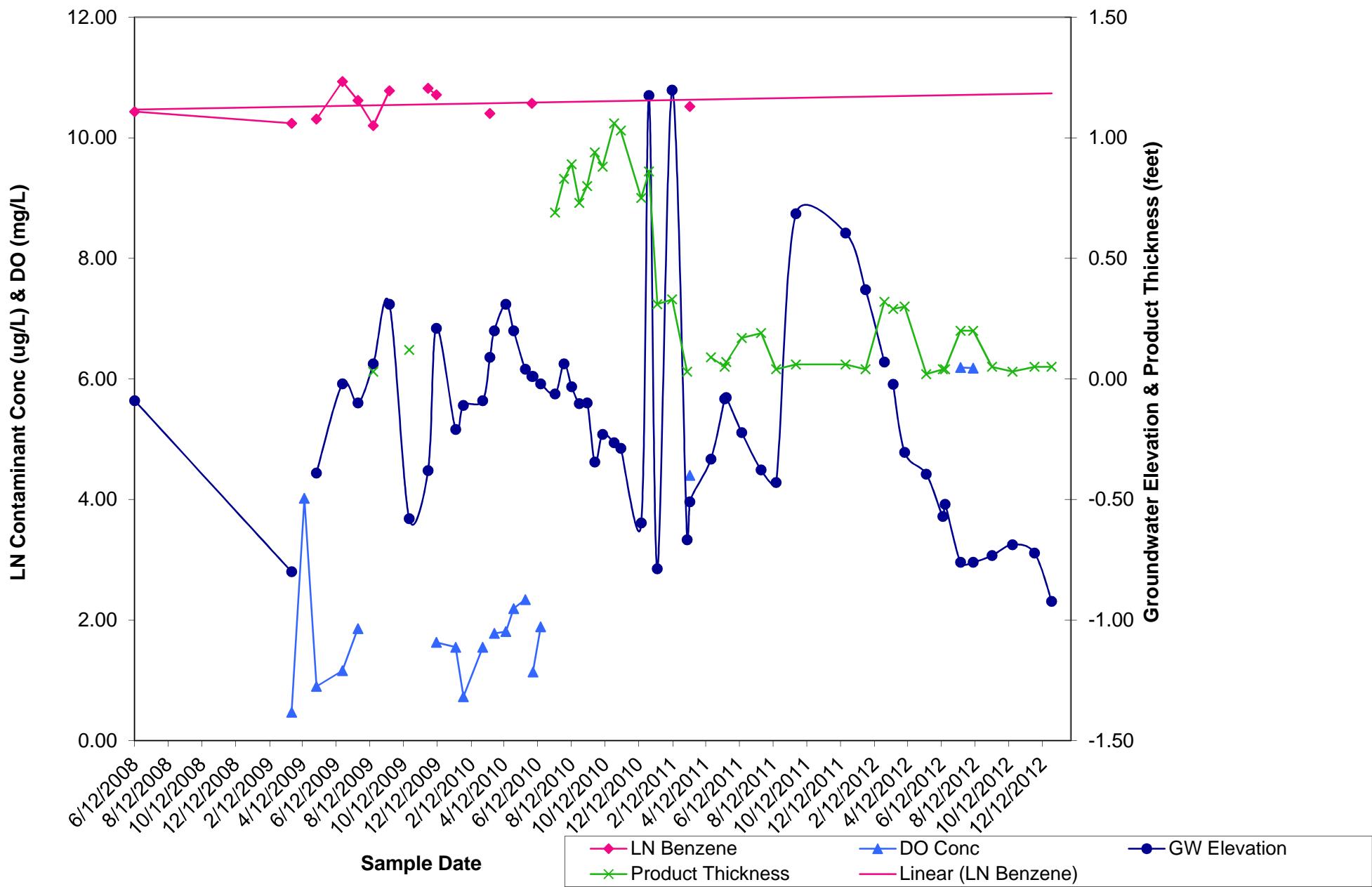
ATTACHMENT C

DO, Benzene and Groundwater Elevation vs Time Graphs

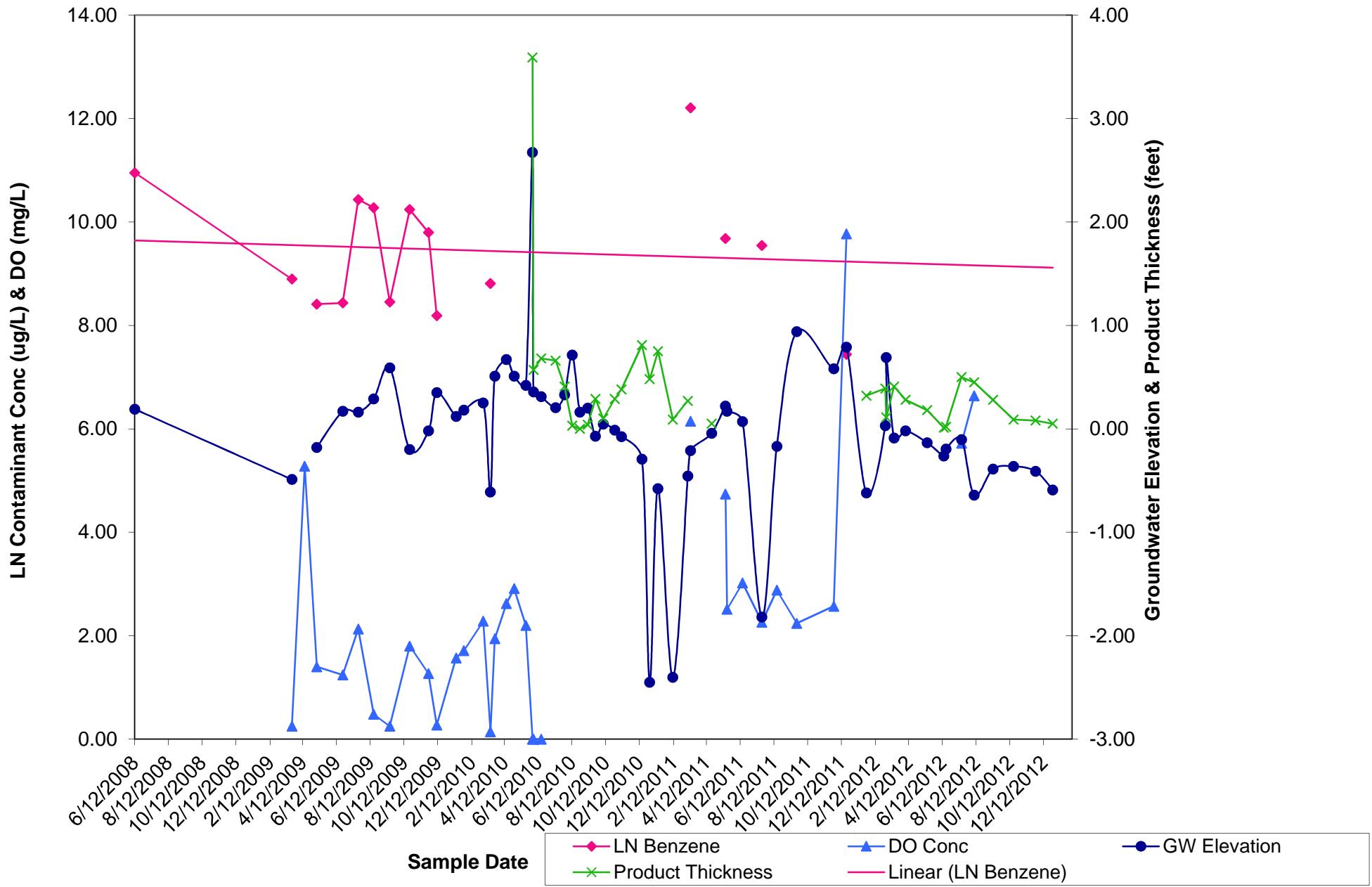
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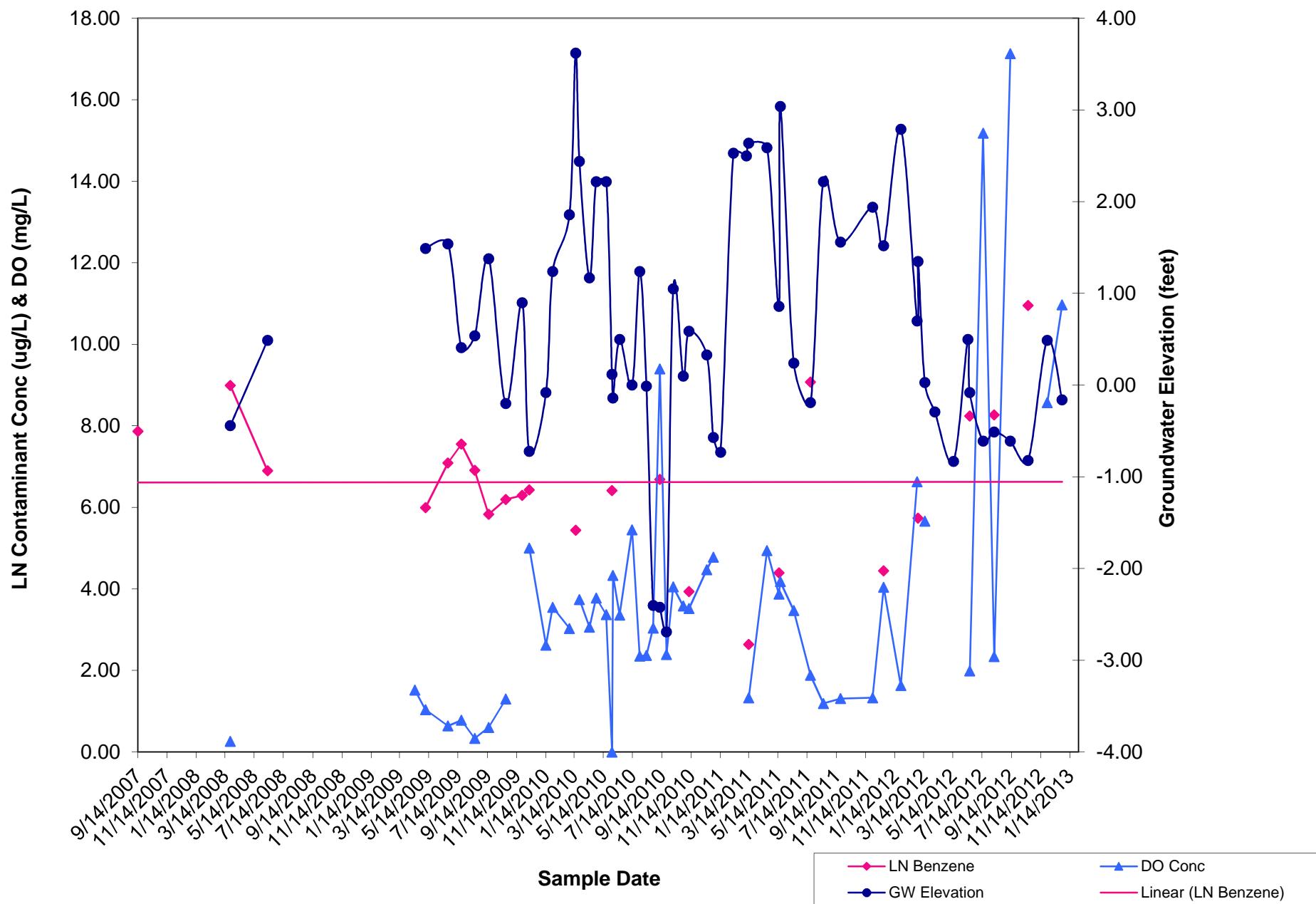
S-210



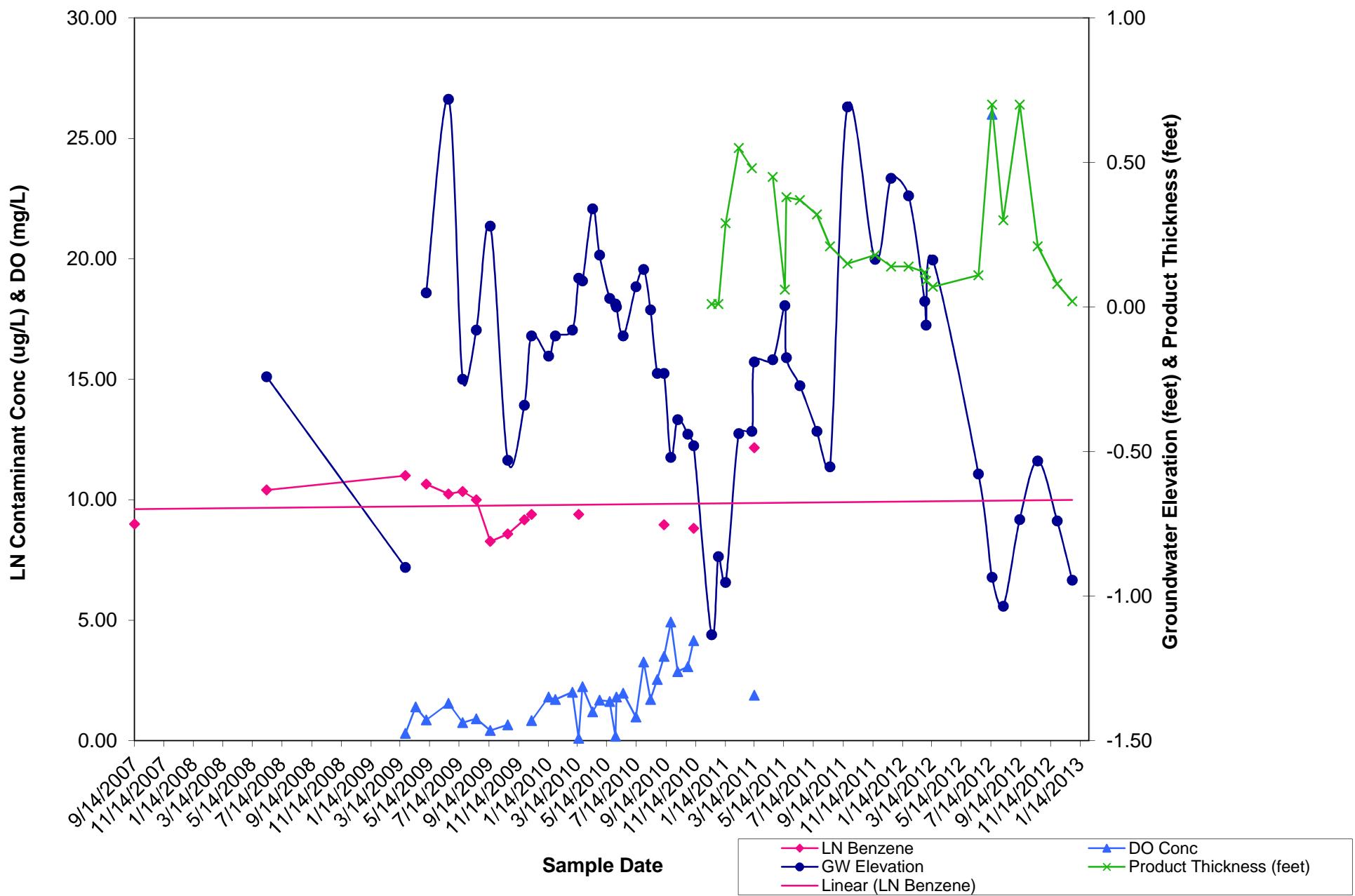
S-226



S-230



S-231



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